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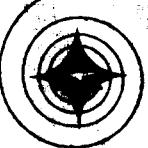
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**APOLLO
MISSION ANALYSIS
(u)**

13 August 1962 **4.5.0**



Prepared by

Operations Analysis

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INTRODUCTION

The purpose of the Apollo mission analysis currently being conducted by Operations Analysis is to provide a logical basis for further studies and analyses. This report, which summarizes the Apollo mission analysis to date, presents approved nomenclature, a breakdown of each mission into distinct phases, and further delineation of activity within each mission phase. Typical Apollo missions include: earth orbital, circumlunar, lunar orbital, and lunar landing (lunar orbital rendezvous).

This introductory section defines and explains the kinds of material presented in this report. The report is divided into sections corresponding to the four missions which have been listed.

MISSION OBJECTIVES

The ultimate objective of Project Apollo is to land men on the moon who will undertake limited observation and exploration of the moon in the vicinity of the landing area, and return to earth. The typical missions referred to here represent steps toward the accomplishment of this objective.

For each mission, an overall objective and several specific objectives are presented. Although certain of the specific objectives relate only to the success of a particular mission, others involve the qualification of systems and procedures to be used in subsequent missions.

SPACE VEHICLE CONFIGURATION

The spacecraft modules and launch vehicle booster stages which compose the space vehicle configuration for each mission are depicted. The command module is the only major module that completes all phases of any mission. The points at which the other spacecraft modules and booster stages are separated are indicated. Complete weight data (at launch) for the modules and booster stages is not available at this point in the program.

FLIGHT TRAJECTORIES

For each typical mission, a flight trajectory diagram is included, giving general indications of the mission trajectory, the relative positions of the earth and moon during the mission, and the location of the earth

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and/or lunar orbits. The flight trajectory is divided into distinct mission phases, indicated by t marks. For example, that part of the trajectory between t_0 and t_1 is referred to (in all typical missions) as the "ascent" phase.

TRAJECTORY EARTH TRACE

A trajectory earth trace for each typical mission is also included. Geometrically, an earth trace is the earth surface trace of an imaginary line between the center of the earth and the moving spacecraft. The trajectory earth trace is divided into the previously mentioned mission phases.

Each earth trace diagram shows the locations of the primary landing site and the GOSS and DSIF tracking stations. The earth orbital mission earth trace indicates, in addition, the alternate landing sites that have been tentatively selected.

PHASE AND OPERATIONAL SEQUENCE

In order to summarize the basic mission concept, a phase and operational sequence is provided for each typical mission. Missions are divided into phases either by the accomplishment of certain propulsion events or by arrival at some geometrical milestone. Operations are the general crew and hardware activities occurring within the spacecraft during each mission phase. For the lunar landing mission, a parallel listing of activity is necessitated by the physical separation of the command and service modules from the lunar excursion module during the mission. The t marks also appear on the phase and operational sequence diagrams.

TIME-LINE ANALYSIS

All of the material explained in the preceding paragraphs can be considered background data for the time-line analysis, which completes each section. The purpose of the time-line analysis is to delineate crew, hardware, and ground support activity during each mission with respect to time. It is divided into four sections.

Prelaunch Time Line

This will appear in subsequent revisions of this report.

Prelaunch activity begins with receipt of major spacecraft modules and launch vehicle booster stages at AMR and ends with lift-off. A flow diagram will be included as part of the prelaunch time-line analysis for each typical mission. This diagram will indicate the progress of major spacecraft modules and the launch vehicle toward final assembly and preparation for launch.

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The activities pertinent to each typical mission will be presented as major events, operations, and functions at AMR (Atlantic Missile Range). Major events at AMR include the physical movement of spacecraft modules to a different AMR facility and activities that can be associated with a specific point in time. Operations are the general activities that occur during the prelaunch phase of the mission at AMR. Functions are the more detailed activities that compose a given operation. Major events can be associated with a specific time; operations and functions occur during particular intervals of time.

Flight Time Line - Part I

A time increment for each mission phase and the total time elapsed as the mission progresses are shown on Part I of the flight time line for each mission. Time data for the lunar landing mission are necessarily an estimate for this report and will be revised following trajectory computations. Major events include propulsion accomplishments and arrival at geometrical milestones. Spacecraft operations are the general crew and hardware activities occurring within the spacecraft during each mission phase. Corresponding to each operation, spacecraft system status is indicated; each system of the command module, service module, and lunar excursion module (when applicable) is designated as on and operating (O), on and standing by (S), off (X), or jettisoned (J). Spacecraft and crew functions are the individual activities which must be performed for each spacecraft operation.

Flight Time Line - Part II

A second part of each flight time line will be prepared and will appear in subsequent revisions of this report. It will provide spacecraft functional details, flight crew functional details, and subsystem and component functional details. The functions of Part II will be referenced to the operations and functions of Part I.

The spacecraft functional details will be defined in terms of the individual attitudes, maneuvers, operations, and functions of individual booster stages and individual spacecraft modules and systems. Detailed references will be made to critical operational environments and to difficult operational situations.

The flight crew functional details will be defined in terms of the individual data display indicators and the individual subsystem or component control devices that are actually provided and used in particular crew functions.

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The subsystem and component functional details will be defined in terms of the physical and operating characteristics of the individual subsystems and components involved in a particular function.

Post-Flight Time Line

The final phase of the mission begins with spacecraft touchdown and extends through command module refurbishment. Major events are activities that can be associated with a given point in time. Command module and support operations are general categories of activity which occur during this phase. Command module system status (on-off) for each operation is also indicated. Functions and subfunctions, which correspond to operations during the post-flight phase, indicate more detailed activity.

The post-flight time-line analysis is the same for all four typical missions.

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EARTH ORBITAL MISSION OBJECTIVES

OVERALL OBJECTIVE

Verification of the feasibility of a 14-day, multimanned, earth-orbital space flight and safe return to earth is the overall objective of this mission.

SPECIFIC OBJECTIVES

Specific objectives of a typical earth orbital mission include the following:

- Verification of the capability of a manned Apollo Spacecraft to complete an orbital mission
- Verification of the operation of GOSS with the manned spacecraft in near space
- Verification of the capability of the manned spacecraft recovery complex
- Evaluation of crew in-flight reaction
- Structural demonstration of atmospheric entry
- Crew training
- Scientific experimentation

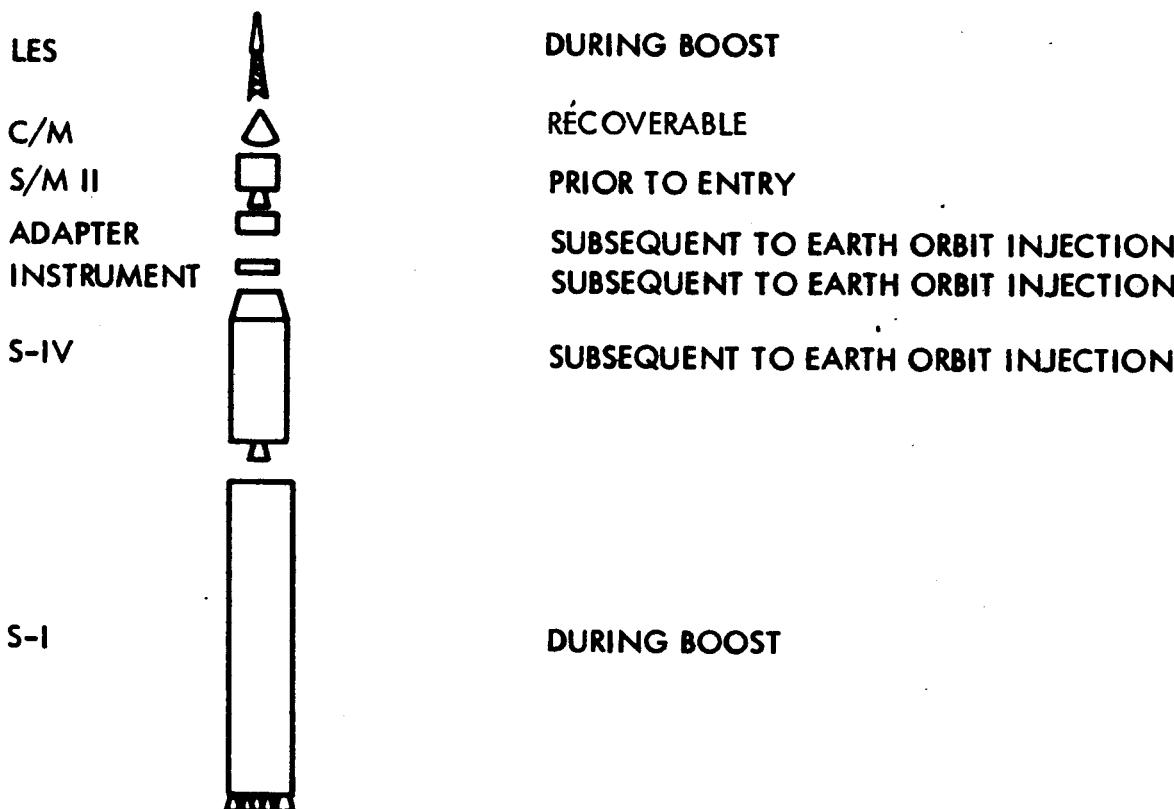
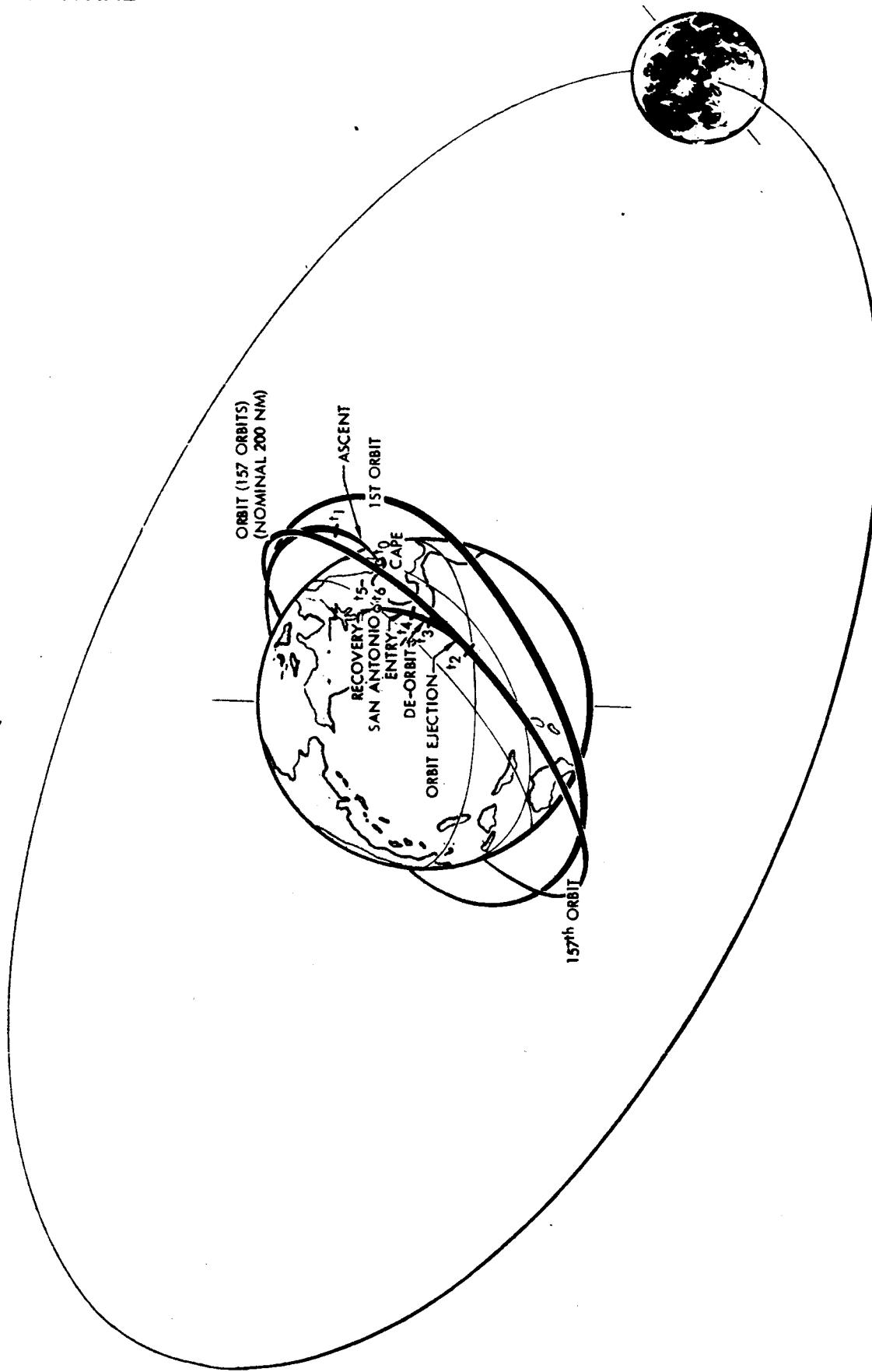
~~CONFIDENTIAL~~SEPARATION OF SPACECRAFT MODULES AND
LAUNCH VEHICLE BOOSTER STAGES

Figure 1. Space Vehicle Configuration—Earth Orbital Mission

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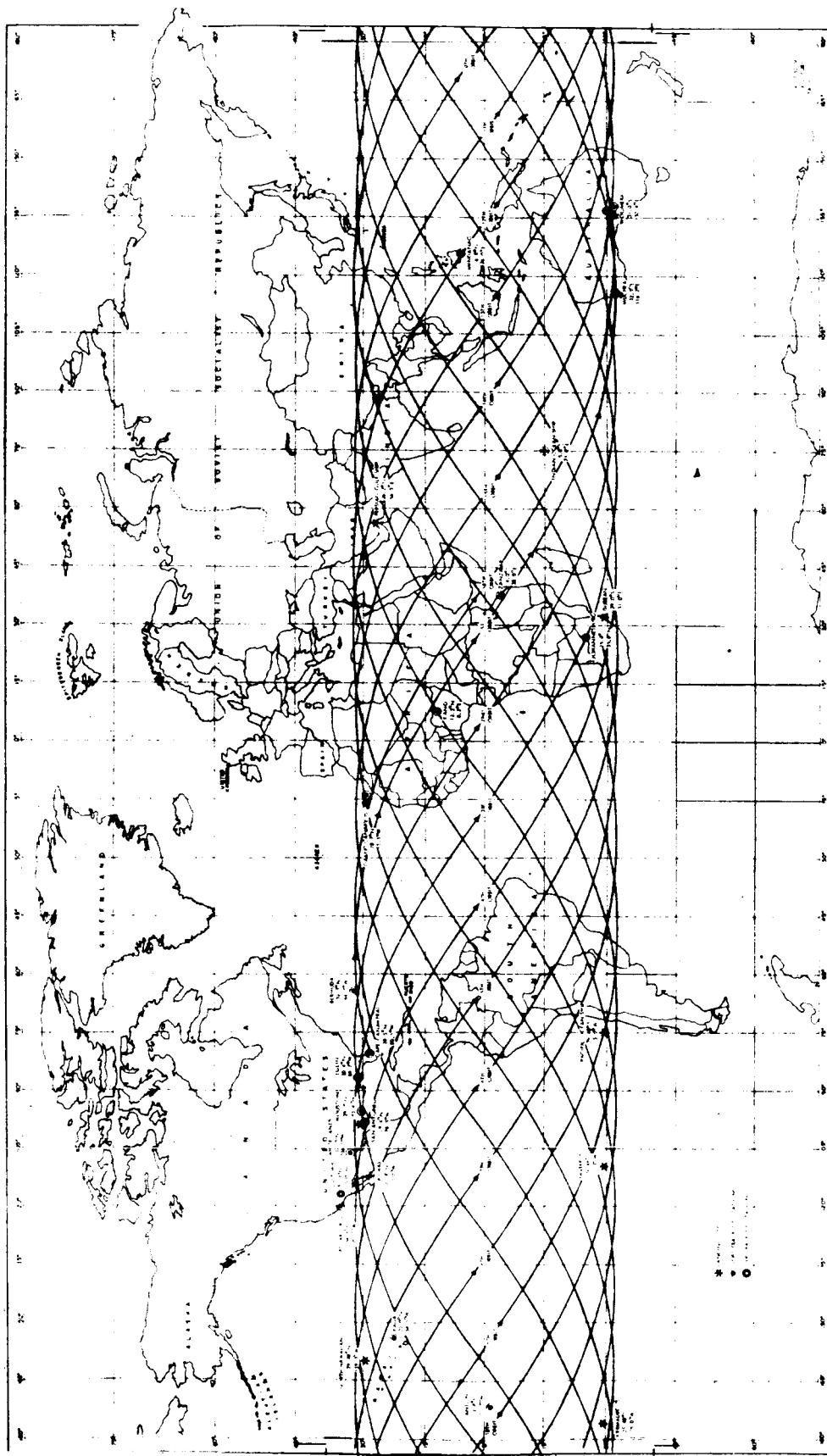
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Figure 3. Trajectory Earth Trace—Earth Orbital Mission

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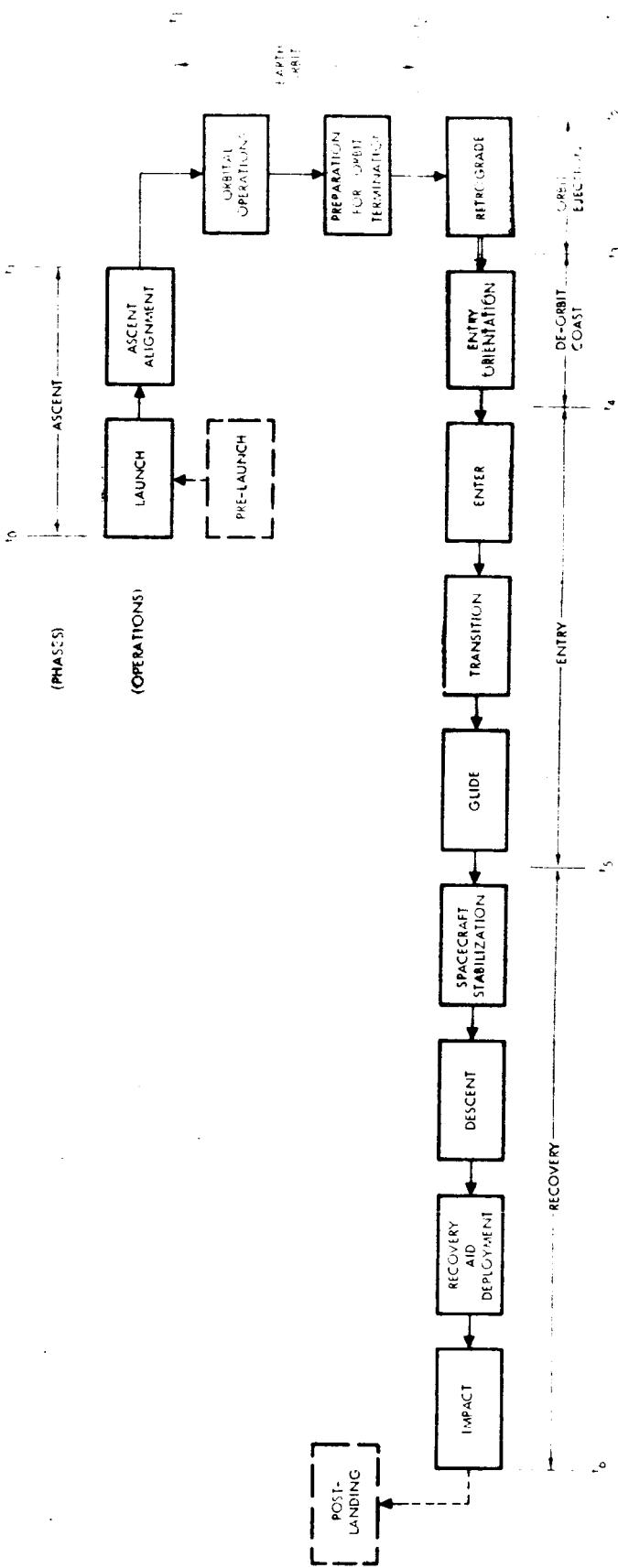
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Figure 4. Phase and Operational Sequence—Earth Orbital Mission

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CIRCUMLUNAR MISSION OBJECTIVES

OVERALL OBJECTIVE

The overall objective of this mission is to verify the feasibility of a 14-day, multimanned, circumlunar space flight and safe return to earth.

SPECIFIC OBJECTIVES

Specific objectives of a typical circumlunar mission include the following:

- Verification of the capability of a manned Apollo Spacecraft to complete a circumlunar mission
- Verification of the operation of GOSS with the manned spacecraft in deep space
- Structural demonstration of atmospheric entry from free-return trajectory
- Evaluation of crew in-flight reaction in deep space
- Lunar surveillance
- Scientific experimentation

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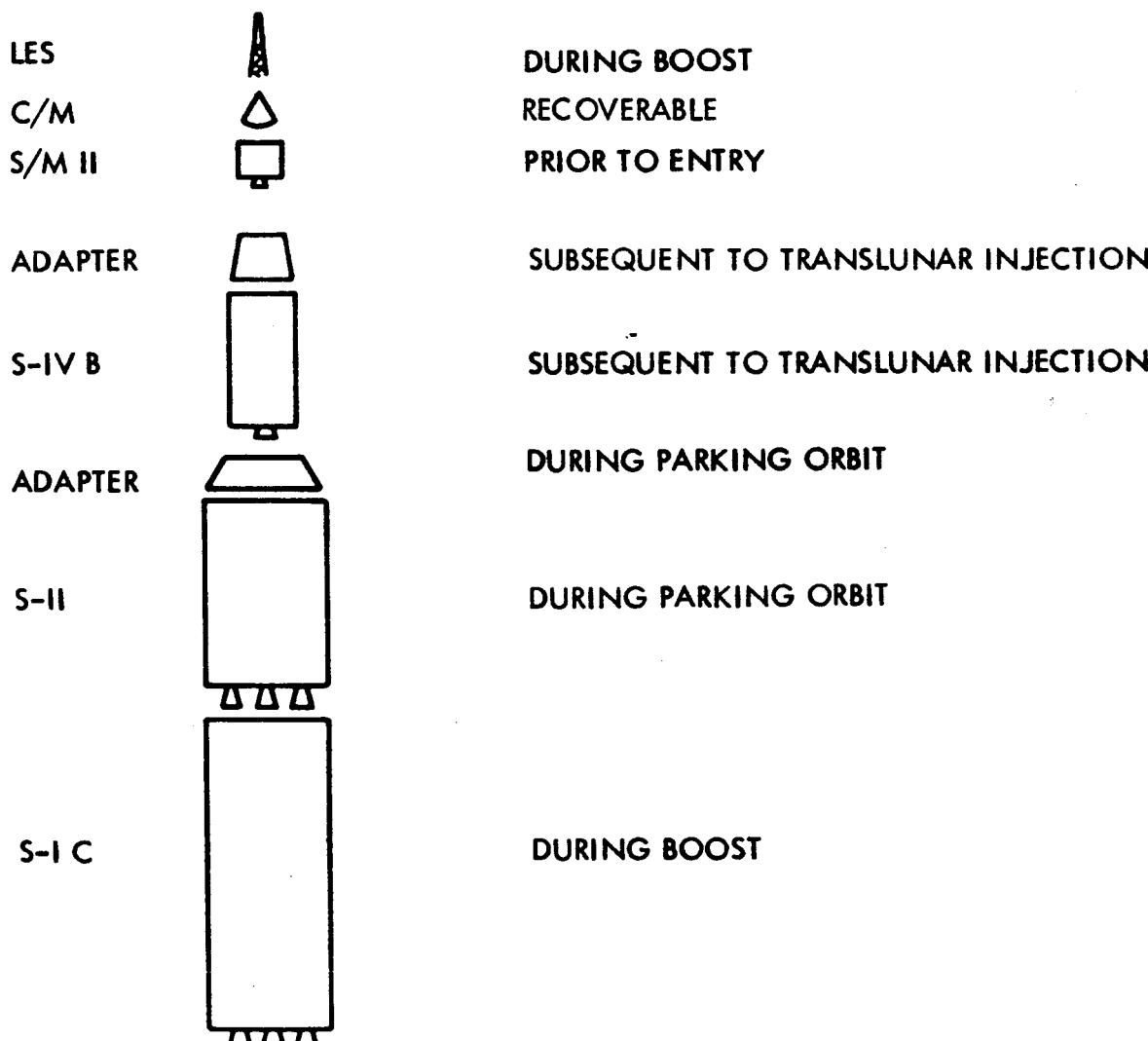
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LAUNCH VEHICLE BOOSTER STAGES

Figure 7. Space Vehicle Configuration—Circumlunar Mission

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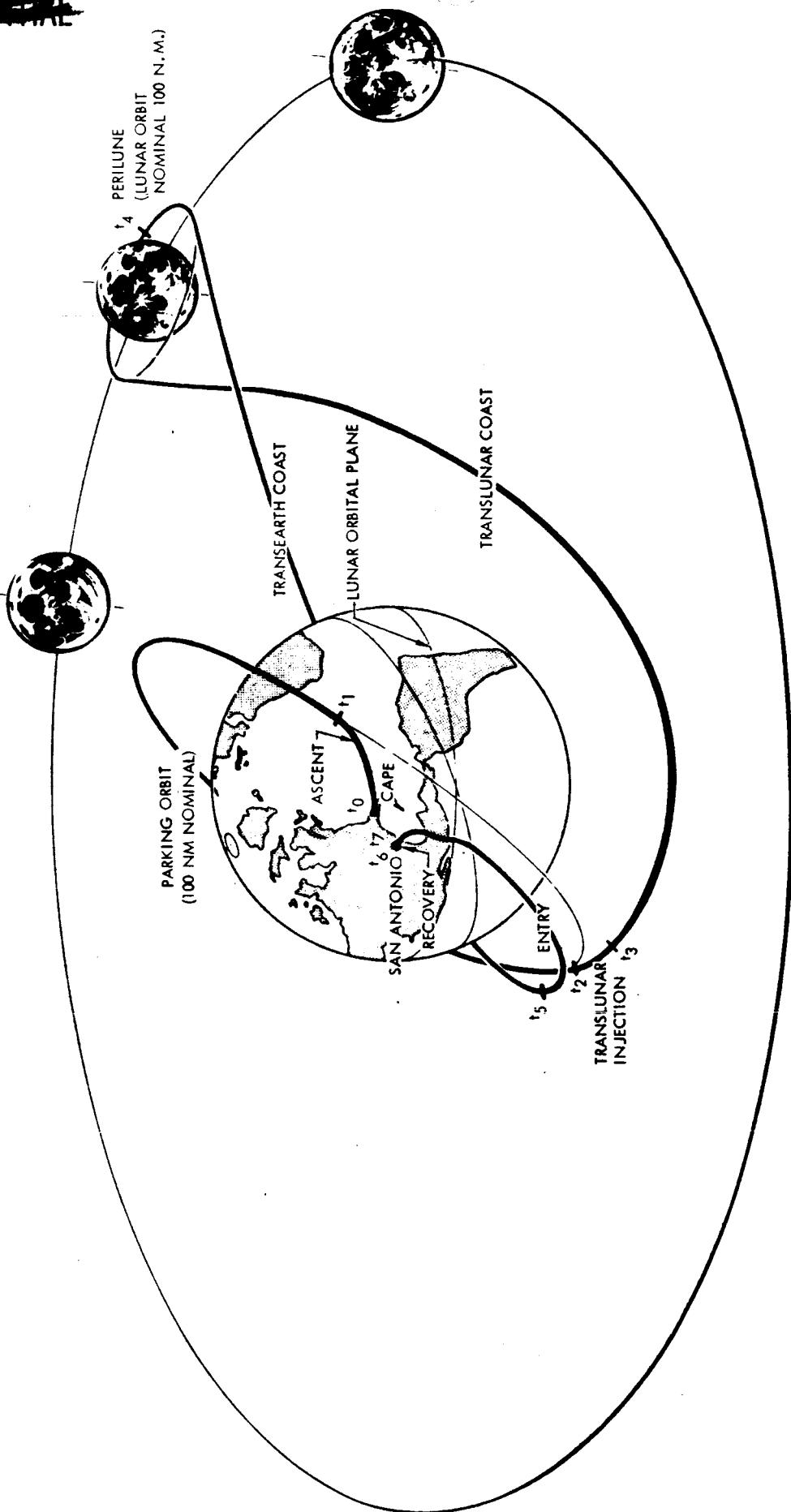


Figure 8. Flight Trajectory--Circumlunar Mission

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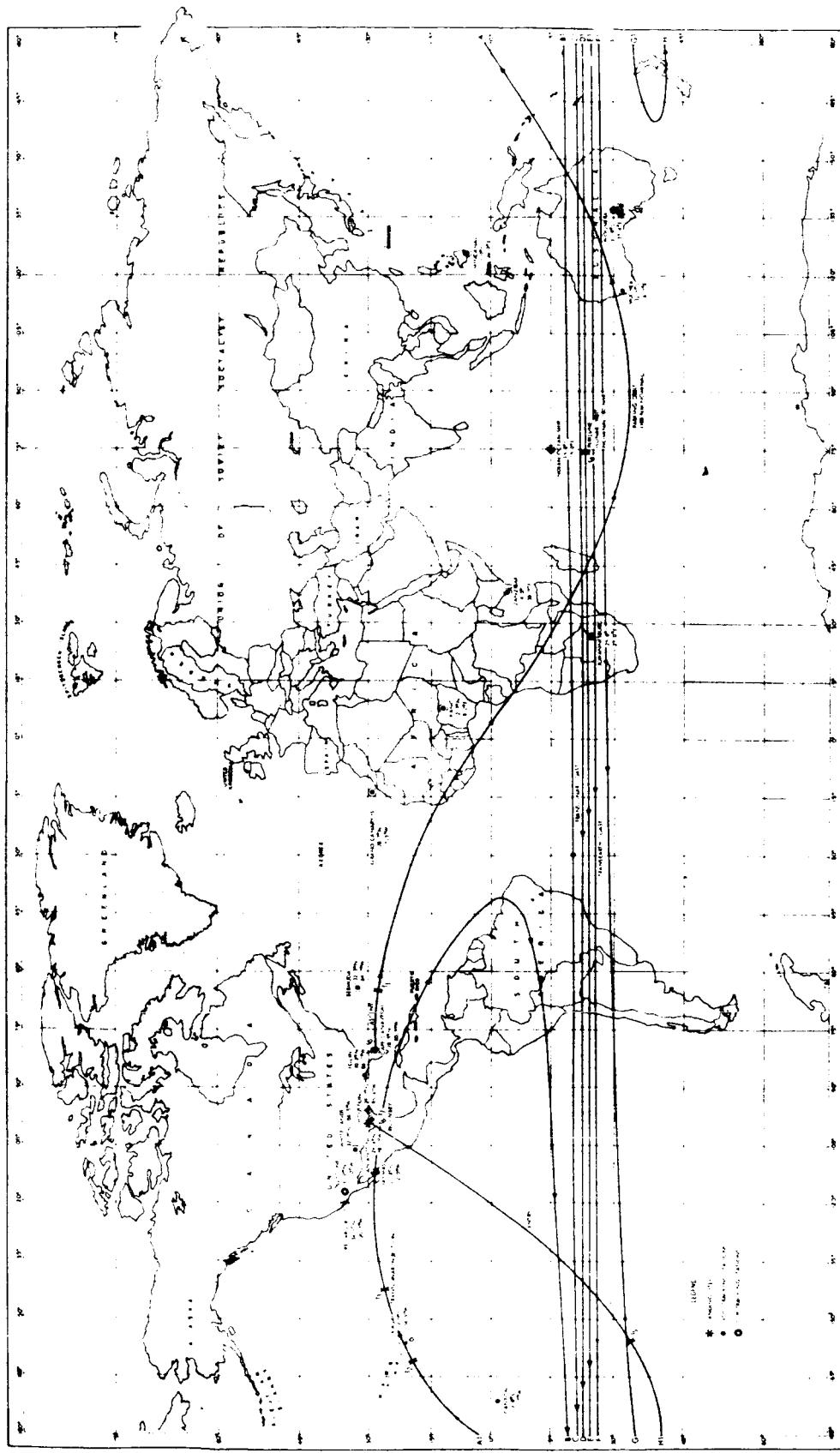
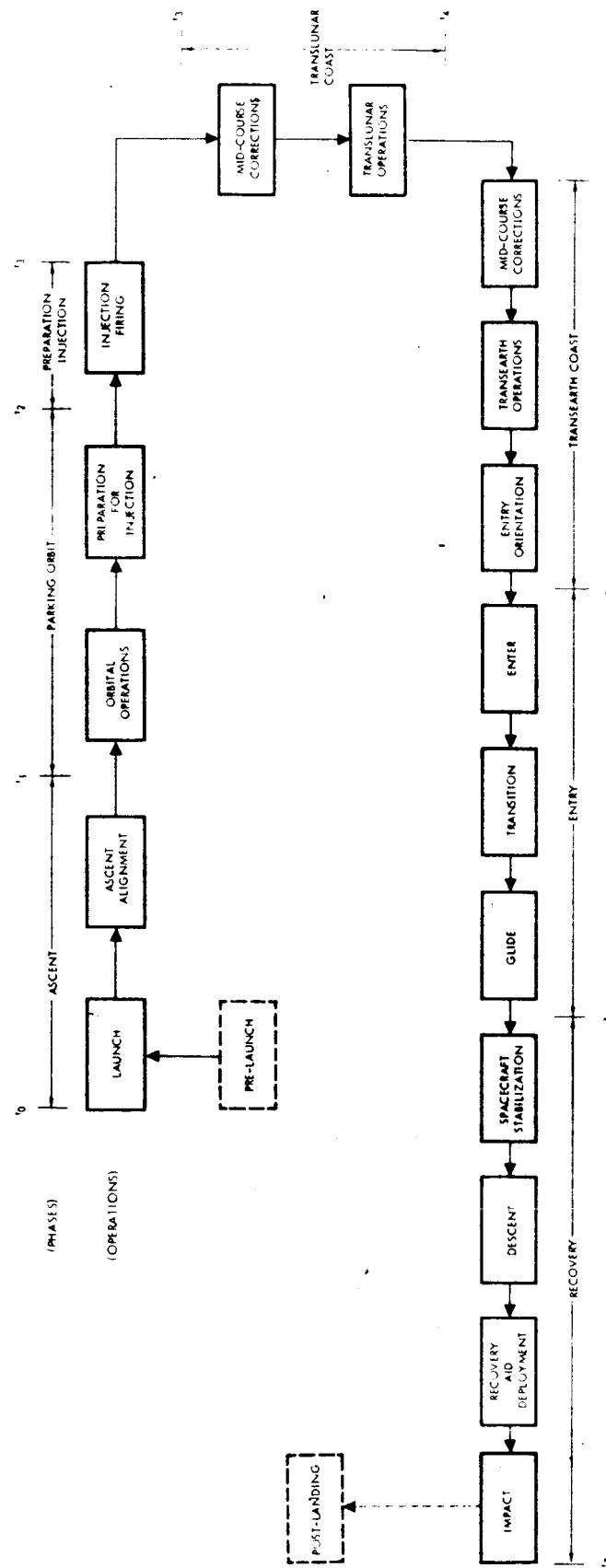


Figure 9. Trajectory Earth Trace—Circumlunar Mission

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Part II of the flight time line will be provided at a later date.

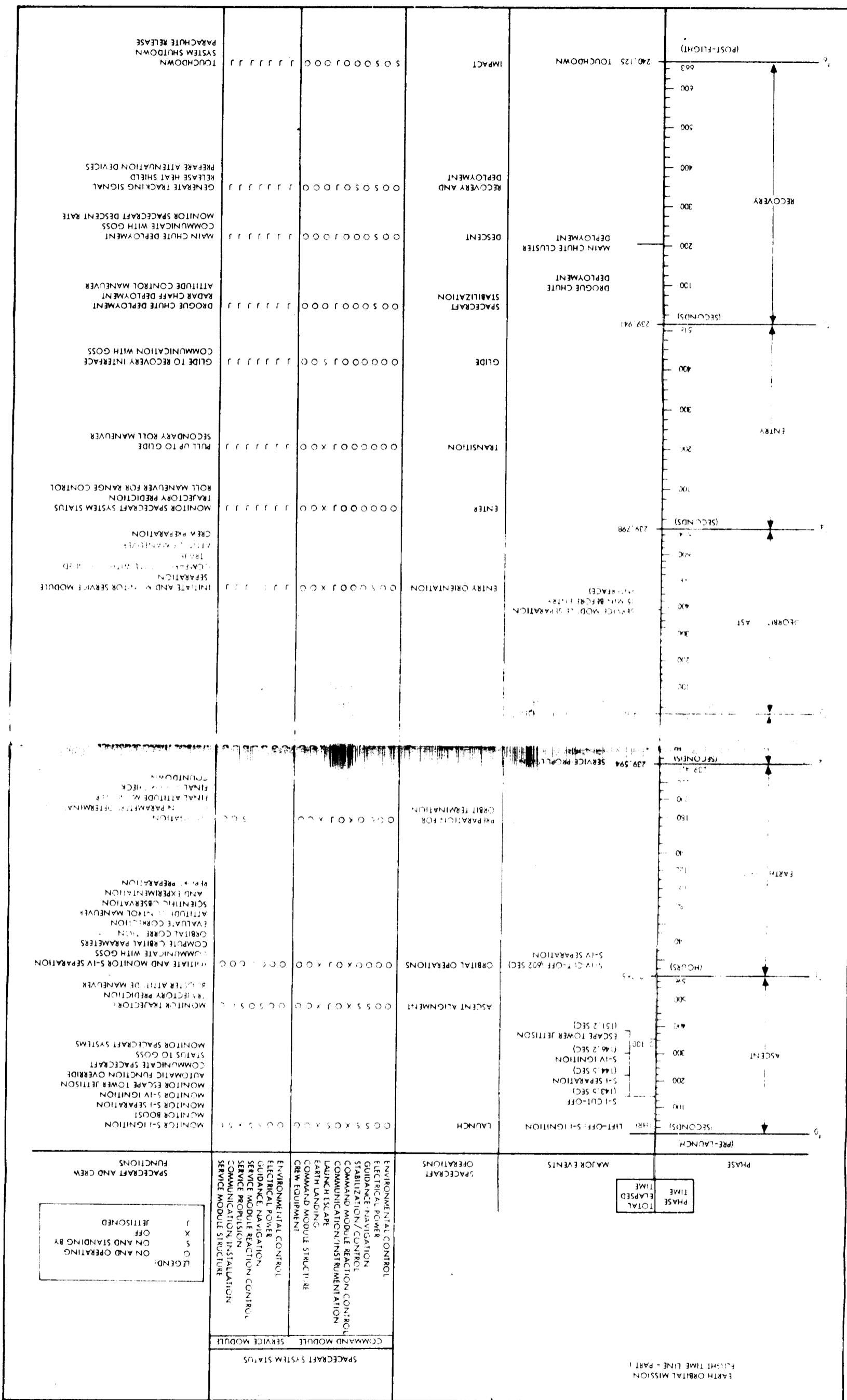
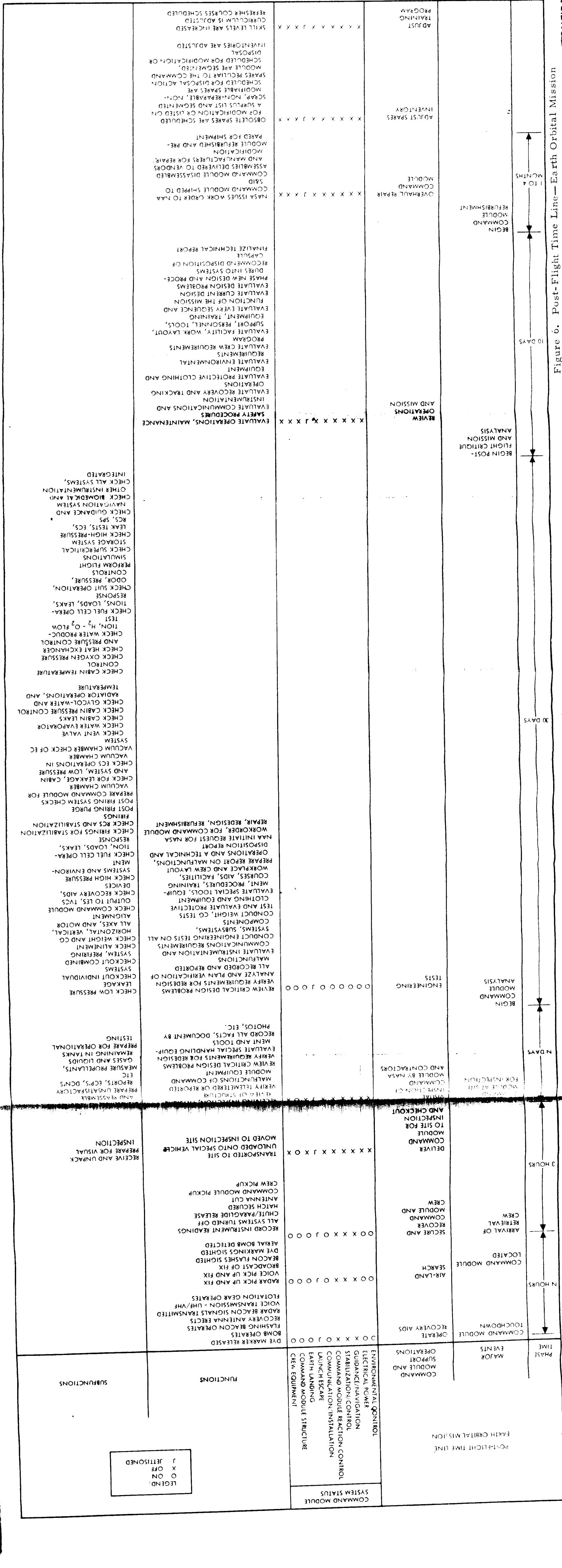


Figure 7. Flight Time Line—Part I—Earth Orbital Mission

Figure 6. Post-Flight Time Line—Earth Orbital Mission



Part II of the flight time line will be provided at a later date.

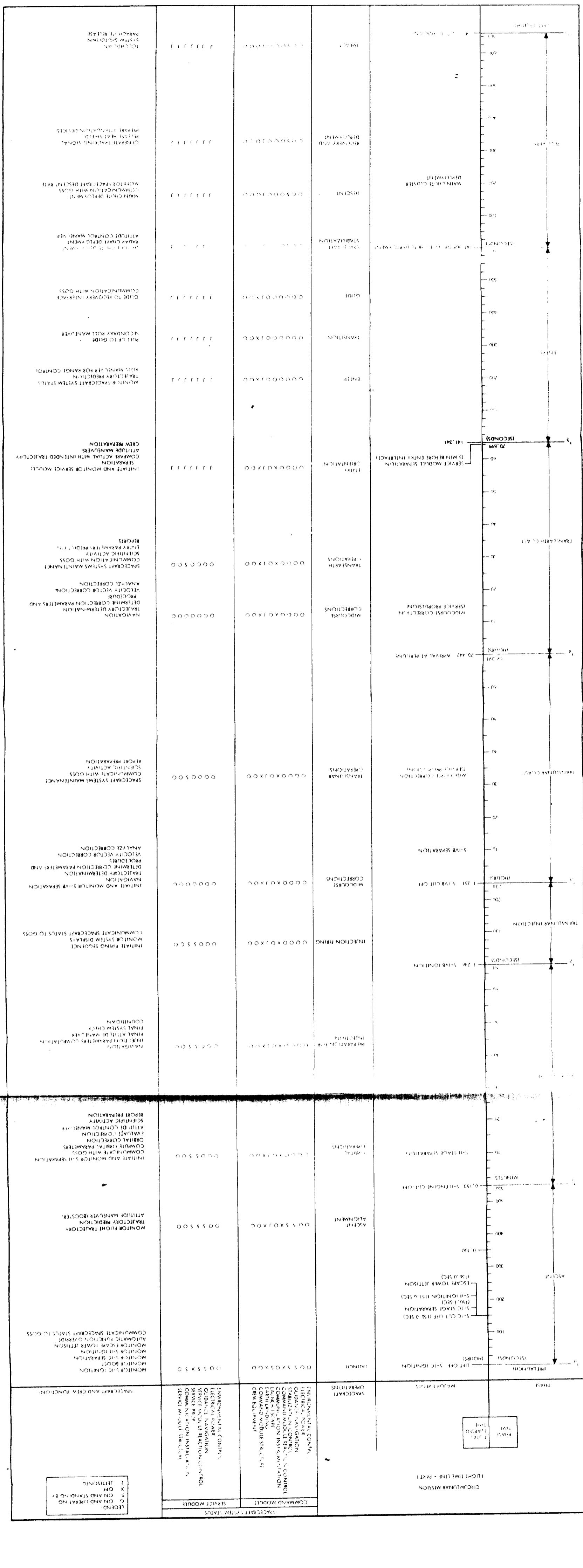


Figure 11. Flight Time Line—Part I—Circumlunar Mission

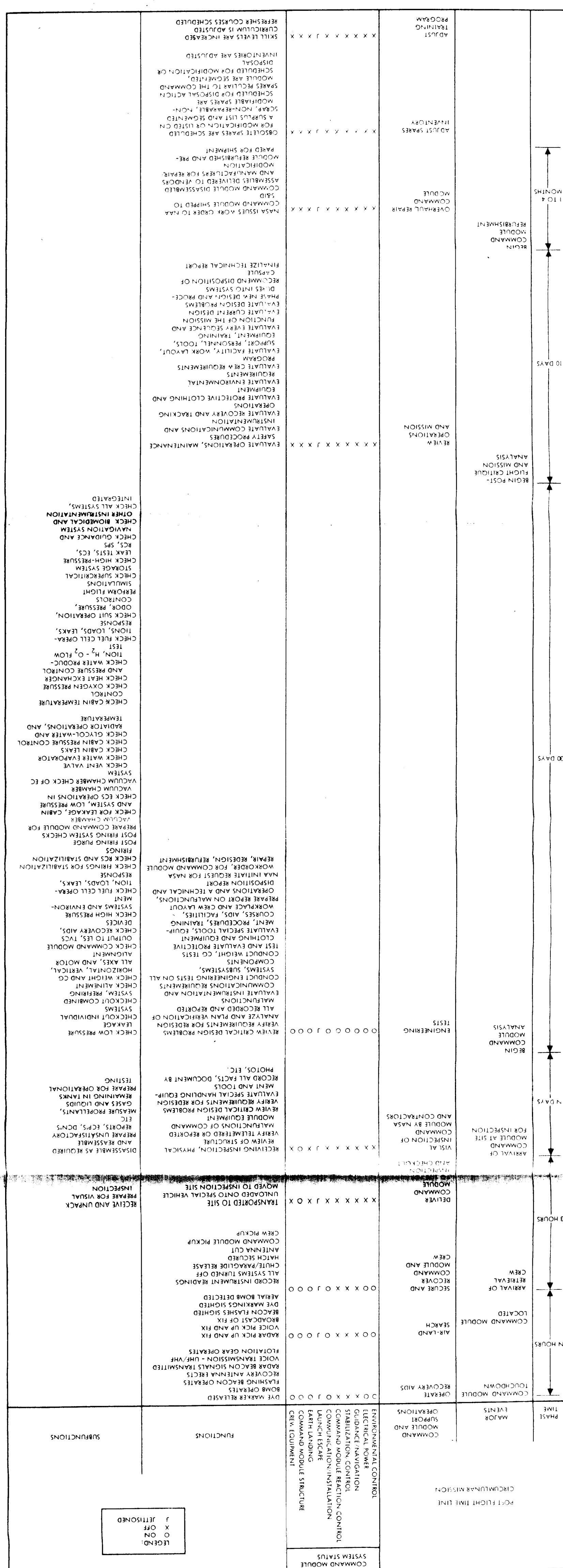


Figure 12. Post-Flight Time Line—Circumlunar Mission

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LUNAR ORBITAL MISSION OBJECTIVES

OVERALL OBJECTIVE

This mission's overall objective is the verification of the feasibility of a 14-day, multimanned, lunar-orbital space flight and safe return to earth.

SPECIFIC OBJECTIVES

Specific objectives of a typical lunar orbital mission include the following:

- Verification of the capability of a manned Apollo Spacecraft to complete a lunar orbital mission
- Verification of the operation of GOSS with the manned spacecraft during an extended stay in the vicinity of the moon
- Evaluation of crew in-flight reaction to extended stay in lunar vicinity
- Extended lunar surveillance
- Preliminary lunar landing site selection
- Scientific experimentation

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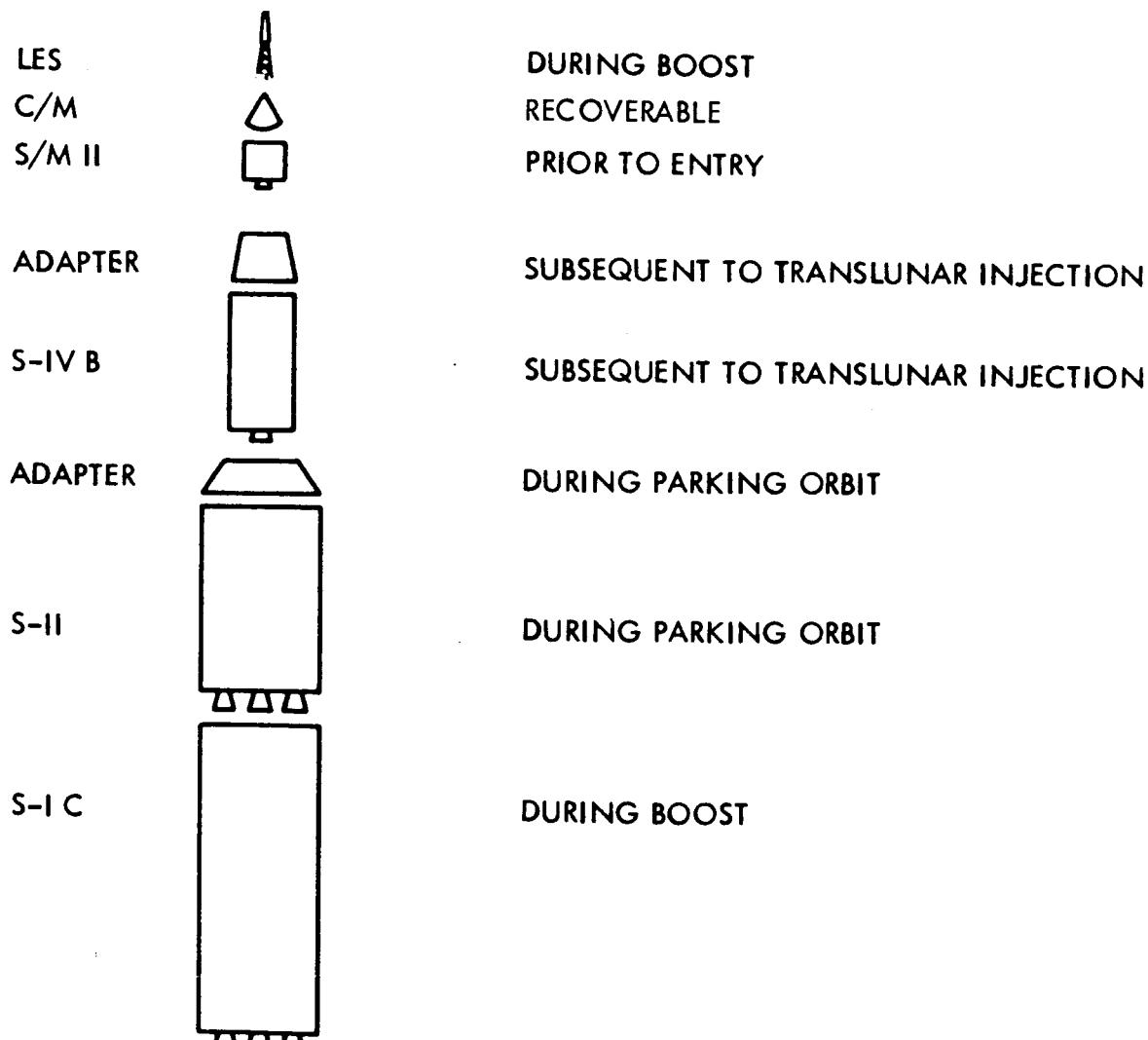
~~CONFIDENTIAL~~SEPARATION OF SPACECRAFT MODULES AND
LAUNCH VEHICLE BOOSTER STAGES

Figure 13. Space Vehicle Configuration—Lunar Orbital Mission

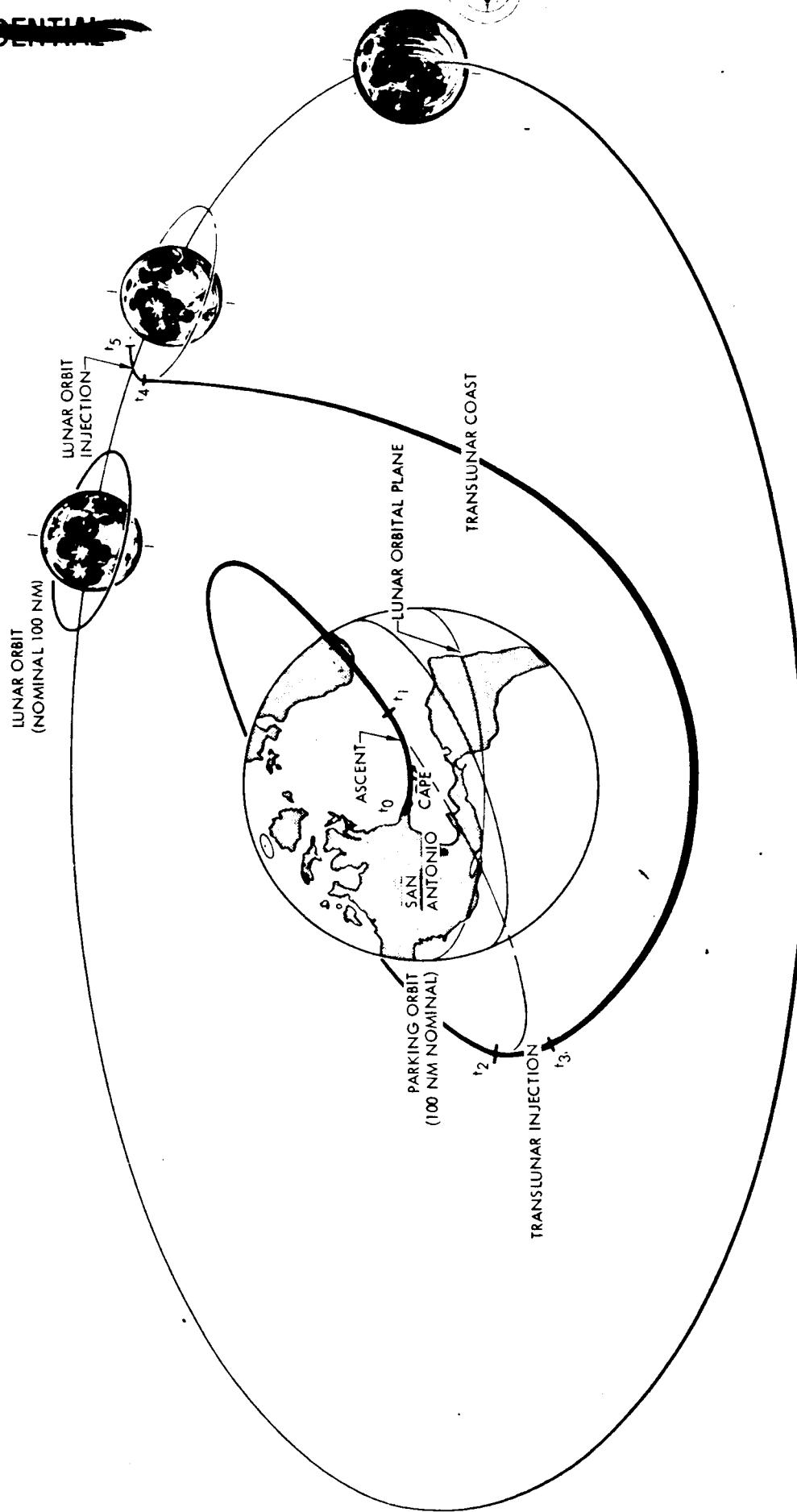
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Figure 14. Flight Trajectory—Lunar Orbital Mission
(Translunar Flight)

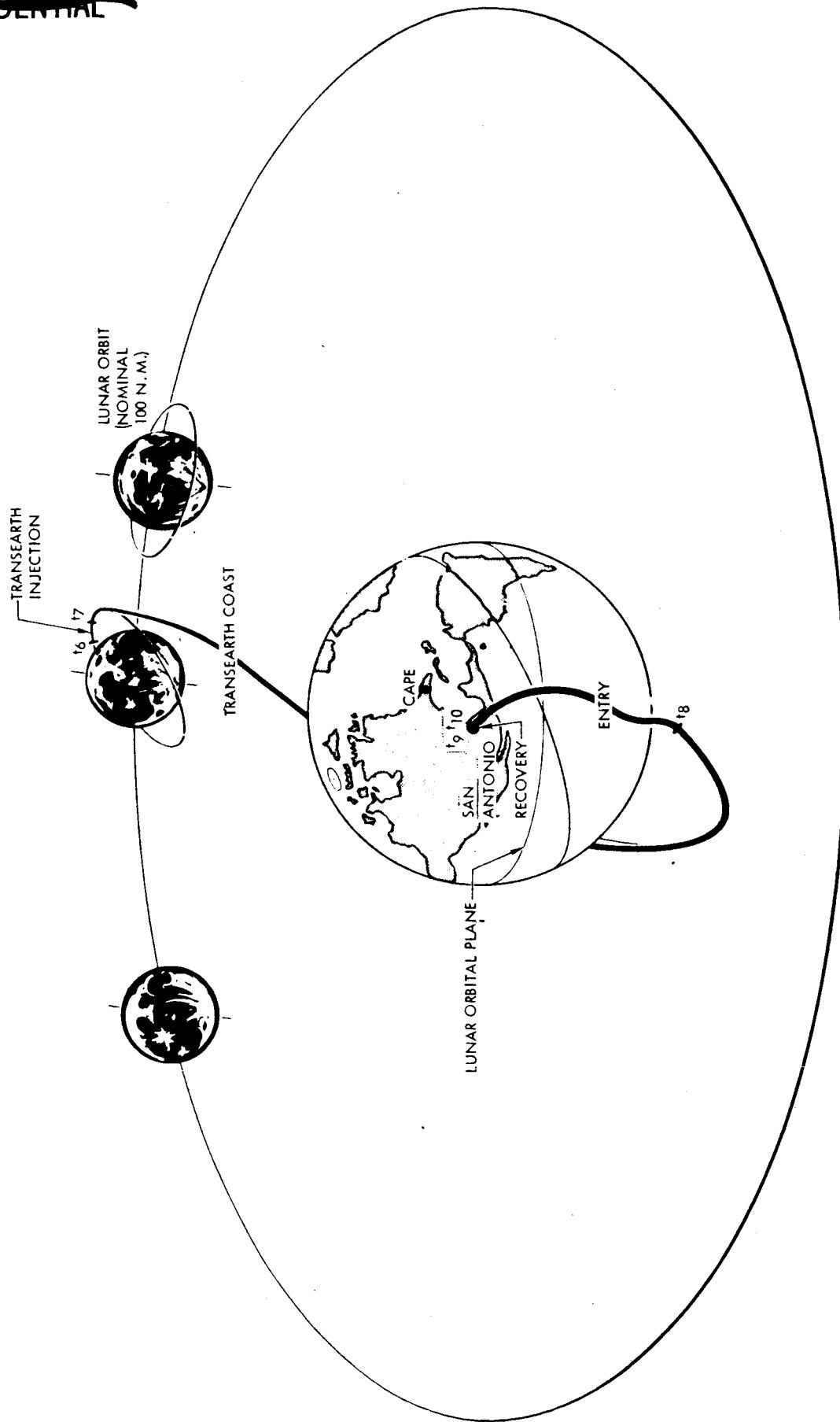
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Figure 15. Flight Trajectory—Lunar Orbital Mission
(Transearth Flight)

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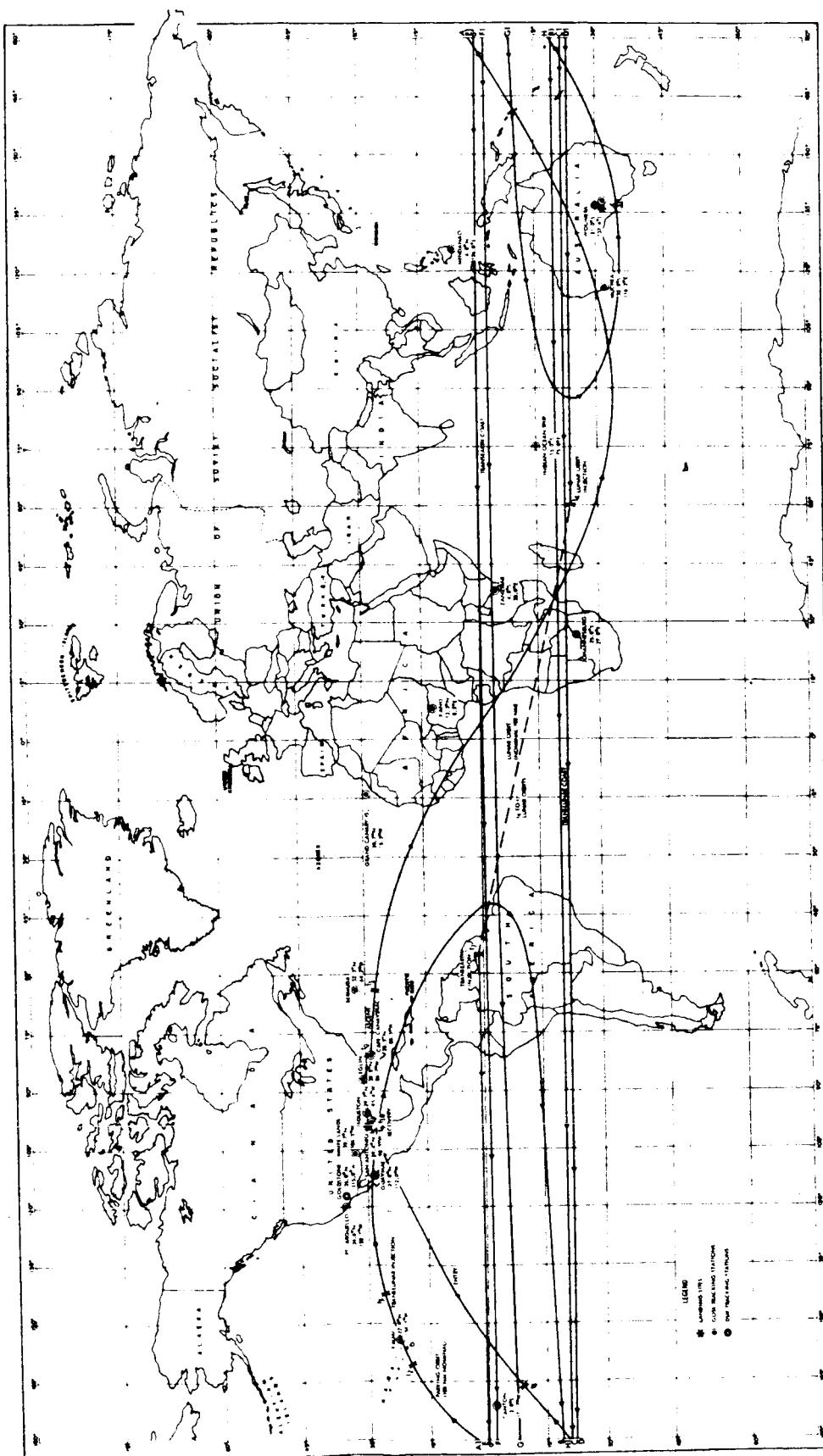
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Figure 16. Trajectory Earth Trace—Lunar Orbital Mission

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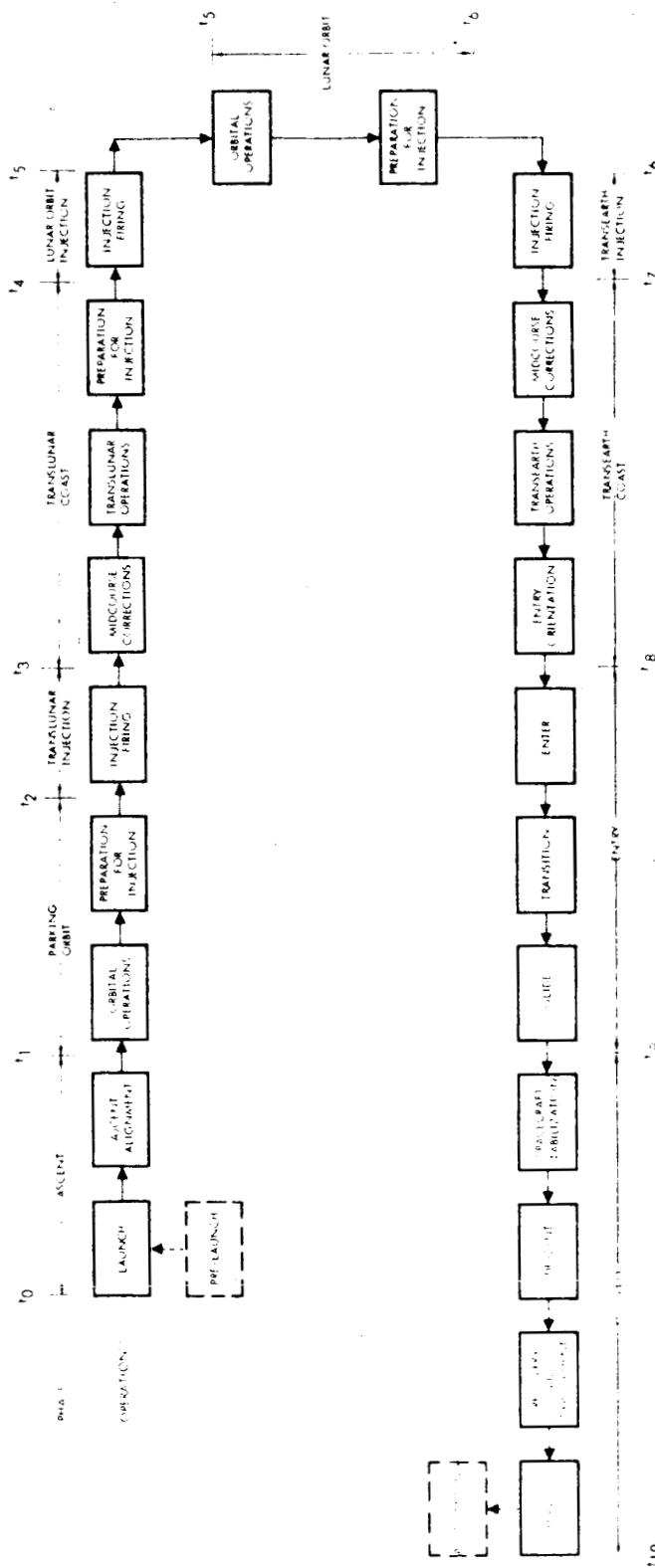


Figure 17. Phase and Operational Sequence—Lunar Orbital Mission

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PHASE	PHASE TIME (SECONDS)	TOTAL ELAPSED TIME (HOURS)	MAJOR EVENTS	SPACECRAFT OPERATIONS	SPACECRAFT SYSTEM STATUS		LEGEND: O ON AND OPERATING S ON AND STANDING BY X OFF J JETTISONED
					COMMAND MODULE	SERVICE MODULE	
ASCENT	0 - 552	0 - 1.153	LIFT OFF: S-IC IGNITION S-IC CUT-OFF S-IC SEPARATION S-II IGNITION (151.0 SEC) ESCAPE TOWER JETTISON (156.0 SEC)	LAUNCH	O O S S X O S X O O	O O S S X S O	MONITOR S-IC IGNITION MONITOR BOOST MONITOR S-IC SEPARATION MONITOR S-II IGNITION MONITOR ESCAPE TOWER JETTISON AUTOMATIC FUNCTION OVERRIDE COMMUNICATION SPACECRAFT STATUS TO GOSS MONITOR SPACECRAFT SYSTEMS
PARKING ORBIT	552 - 68	1.153 - 1.286	ASCENT ALIGNMENT S-II STAGE SEPARATION	ASCENT ALIGNMENT ORBITAL OPERATIONS	O O S S X O J X O O O O O S S O	O O S S X S O	MONITOR FLIGHT TRAJECTORY TRAJECTORY PREDICTION ATTITUDE MANEUVER (BOOSTED)
TRANSLUNAR INJECTION	68 - 234	1.286 - 1.351	PREPARATION FOR INJECTION S-IVB IGNITION	INJECTION FIRING	O O O O X O J X O O O O O S S O	O O O O S S O	INITIATE AND MONITOR S-II SEPARATION COMMUNICATE WITH GOSS COMPUTE ORBITAL PARAMETERS ORBITAL CORRECTION EVALUATE CORRECTION ATTITUDE CONTROL MANEUVER SPACECRAFT SYSTEMS CHECKOUT SCIENTIFIC ACTIVITY REPORT PREPARATION
TRANSLUNAR COAST	234 - 69.091	1.351 - 70.442	MIDCOURSE CORRECTIONS S-IVB SEPARATION MIDCOURSE CORRECTION (SERVICE PROPULSION)	MIDCOURSE CORRECTIONS TRANSLUNAR OPERATIONS	O O O O X O J X O O O O O S O O	O O O O S S O	NAVIGATION INJECTION PARAMETERS COMPUTATION FINAL ATTITUDE MANEUVER FINAL SYSTEM CHECK COUNTDOWN
LUNAR ORBIT INJECTION	69.091 - 107.04	70.442 - 70.492	PREPARATION FOR INJECTION SERVICE PROPULSION IGNITION (ARRIVAL AT PERILUNE)	INJECTION FIRING	O O O O X O J X O O O O O O O O O	O O O O S S O	INITIATE FIRING SEQUENCE MONITOR SYSTEM DISPLAYS COMMUNICATE SPACECRAFT STATUS
LUNAR ORBIT	107.04 - 177.532	70.492 - 177.532	ESTABLISH ORBIT SERVICE PROPULSION IGNITION	ORBITAL OPERATIONS	O O C O X O J X O O O O O S O O	O O O O S S O	SPACECRAFT SYSTEMS MAINTENANCE COMPUTE ORBITAL PARAMETERS ORBITAL CORRECTION ORBITAL ADJUSTMENT LUNAR SURVEILLANCE SCIENTIFIC ACTIVITY COMMUNICATION WITH GOSS ATTITUDE CONTROL MANEUVER
TRANSEARTH INJECTION	177.532 - 177.599	177.532 - 177.599	PREPARATION FOR INJECTION MIDCOURSE CORRECTION (SERVICE PROPULSION)	INJECTION FIRING	O O O U X O J X O O O O O O O O O O	O O O O S S O	NAVIGATION INJECTION PARAMETERS COMPUTATION FINAL ATTITUDE MANEUVER FINAL SYSTEM CHECK COUNTDOWN
TRANSEARTH COAST	177.599 - 243.399	177.599 - 243.399	MIDCOURSE OPERATIONS TRANSEARTH OPERATIONS	MIDCOURSE OPERATIONS TRANSEARTH OPERATIONS	O O O O X O J X O O O O C O O O S O O	O O O O S S O	INITIATE FIRING SEQUENCE MONITOR SYSTEMS DISPLAYS COMMUNICATE SPACECRAFT STATUS
ENTRY	243.399 - 244.279	243.399 - 244.279	ENTER TRANSITION GLIDE	ENTER TRANSITION GLIDE	O O C O O O J X O O J J J J J J J J	O O C O O O J X O O J J J J J J J J	NAVIGATION TRAJECTORY DETERMINATION DETERMINE CORRECTION PARAMETERS AND PROCEDURES VELOCITY VECTOR CORRECTION ANALYZE CORRECTION
RECOVERY	244.279 - 244.463	244.279 - 244.463	SPACECRAFT STABILIZATION DESCENT RECOVERY AID DEPLOYMENT	SPACECRAFT STABILIZATION DESCENT RECOVERY AID DEPLOYMENT	O O S O O C J O O O J J J J J J J J	O O S O O C J O O O J J J J J J J J	SPACECRAFT SYSTEMS MAINTENANCE ENTRY PARAMETERS PREDICTION SCIENTIFIC ACTIVITY COMMUNICATION WITH GOSS REPORTS PREPARATION
(POST FLIGHT)	244.463 - 244.463	244.463 - 244.463	IMPACT	IMPACT	S O S C O O J O O C J J J J J J J J	S O S C O O J O O C J J J J J J J J	INITIATE AND MONITOR SERVICE MODULE SEPARATION COMPARE ACTUAL WITH INTENDED TRAJECTORY ATTITUDE CONTROL MANEUVER CREW PREPARATION MONITOR SPACECRAFT SYSTEM STATUS TRAJECTORY PREDICTION ROLL MANEUVER FOR RANGE CONTROL
							PULL UP TO GLIDE SECONDARY ROLL MANEUVER
							GLIDE TO RECOVERY INTERFACE COMMUNICATION WITH GOSS
							DROGUE CHUTE DEPLOYMENT RADAR CHAFFE DEPLOYMENT ATTITUDE CONTROL MANEUVER
							MAINCHUTE DEPLOYMENT COMMUNICATION WITH GOSS MONITOR SPACECRAFT DESCENT RATE GENERATE TRACKING SIGNAL RELEASE HEAT SHIELD PREPARE ATTENUATION DEVICES
							TOUCHDOWN SYSTEM SHUTDOWN PARACHUTE RELEASE

Figure 18. Flight Time Line—Part I—Lunar Orbital Mission

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POST FLIGHT TIME LINE LUNAR ORBITAL MISSION			COMMAND MODULE SYSTEM STATUS	FUNCTIONS	SUBFUNCTIONS
PHASE TIME	MAJOR EVENTS	COMMAND MODULE AND SUPPORT OPERATIONS	ENVIRONMENTAL CONTROL ELECTRICAL POWER GUIDANCE/NAVIGATION STABILIZATION CONTROL COMMAND MODULE REACTION CONTROL COMMUNICATION/INSTALLATION LAUNCH ESCAPE EARTH LANDING COMMAND MODULE STRUCTURE CREW EQUIPMENT		
N HOURS	COMMAND MODULE TOUCHDOWN	OPERATE RECOVERY AIDS	O O X X X O J O O O	DYE MARKER RELEASED BOMB OPERATES FLASHING BEACON OPERATES RECOVERY ANTENNA ERECTS RADAR BEACON SIGNALS TRANSMITTED VOICE TRANSMISSION - UHF/VHF FLOTATION GEAR OPERATES	
3 HOURS	COMMAND MODULE LOCATED	AIR-LAND SEARCH	O O X X X O J O O O	RADAR PICK UP AND FIX VOICE PICK UP AND FIX BROADCAST OF FIX BEACON FLASHES SIGHTED DYE MARKINGS SIGHTED AERIAL BOMB DETECTED	
N DAYS	ARRIVAL OF RETRIEVAL CREW	SECURE AND RECOVER COMMAND MODULE AND CREW	O O X X X O J O O O	RECORD INSTRUMENT READINGS ALL SYSTEMS TURNED OFF CHUTE/PARAGLIDE RELEASE HATCH SECURED ANTENNA CUT COMMAND MODULE PICKUP CREW PICKUP	RECEIVE AND UNPACK PREPARE FOR VISUAL INSPECTION
30 DAYS	ARRIVAL OF DEMOLISHED MODULE AT SITE FOR INSPECTION	DELIVER COMMAND MODULE TO SITE FOR INSPECTION AND CHECKOUT	X X X X X X J X O X	RECEIVING INSPECTION, PHYSICAL REVIEW OF STRUCTURE VERIFY TELEMETRED OR REPORTED MALFUNCTIONS OF COMMAND MODULE EQUIPMENT REVIEW CRITICAL DESIGN PROBLEMS VERIFY REQUIREMENTS FOR REDESIGN EVALUATE SPECIAL HANDLING EQUIP- MENT AND TOOLS RECORD ALL FACTS, DOCUMENT BY PHOTOS, ETC.	DISMASSEMBLE AS REQUIRED AND REASSEMBLE PREPARE UNSATISFACTORY REPORTS, ECP'S, DCN'S ETC MEASURE PROPELLANTS, GASES AND LIQUIDS REMAINING IN TANKS PREPARE FOR OPERATIONAL TESTING
10 DAYS	BEGIN COMMAND MODULE ANALYSIS	ENGINEERING TESTS	O O O O O O J O O O	REVIEW CRITICAL DESIGN PROBLEMS VERIFY REQUIREMENTS FOR REDESIGN ANALYZE AND PLAN VERIFICATION OF ALL RECORDED AND REPORTED MALFUNCTIONS EVALUATE INSTRUMENTATION AND COMMUNICATIONS REQUIREMENTS CONDUCT ENGINEERING TESTS ON ALL SYSTEMS, SUBSYSTEMS, COMPONENTS CONDUCT WEIGHT, CG TESTS TEST AND EVALUATE PROTECTIVE CLOTHING AND EQUIPMENT EVALUATE SPECIAL TOOLS, EQUIP- MENT, PROCEDURES, TRAINING COURSES, AIDS, FACILITIES, WORKPLACE AND CREW LAYOUT PREPARE REPORT ON MALFUNCTIONS, OPERATIONS AND A TECHNICAL AND DISPOSITION REPORT NAA INITIATE REQUEST FOR NASA WORKORDER, FOR COMMAND MODULE REPAIR, REDESIGN, REFURBISHMENT	CHECK LOW PRESSURE LEAKAGE CHECKOUT INDIVIDUAL SYSTEMS CHECKOUT COMBINED SYSTEM, PREFLYING CHECK ALIGNMENT CHECK WEIGHT AND CG HORIZONTAL, VERTICAL, ALL AXES, AND MOTOR ALIGNMENT CHECK COMMAND MODULE OUTPUT TO LES, TVCS CHECK RECOVERY AIDS, DEVICES CHECK HIGH PRESSURE SYSTEMS AND ENVIRON- MENT CHECK FUEL CELL OPERA- TION, LOADS, LEAKS, RESPONSE CHECK FIRINGS FOR STABILIZATION CHECK RCS AND STABILIZATION FIRINGS POST FIRING PURGE POST FIRING SYSTEM CHECKS PREPARE COMMAND MODULE FOR VACUUM CHAMBER CHECK FOR LEAKAGE, CABIN AND SYSTEM, LOW PRESSURE CHECK ECS OPERATIONS IN VACUUM CHAMBER VACUUM CHAMBER CHECK OF EC SYSTEM CHECK VENT VALVE CHECK WATER EVAPORATOR CHECK CABIN LEAKS CHECK CABIN PRESSURE CONTROL CHECK GLYCOL-WATER AND RADIATOR OPERATIONS, AND TEMPERATURE CHECK CABIN TEMPERATURE CONTROL CHECK OXYGEN PRESSURE CHECK HEAT EXCHANGER AND PRESSURE CONTROL CHECK WATER PRODUC- TION, H ₂ - O ₂ FLOW TEST CHECK FUEL CELL OPERA- TIONS, LOADS, LEAKS, RESPONSE CHECK SUIT OPERATION, ODOR, PRESSURE, CONTROLS PERFORM FLIGHT SIMULATIONS CHECK SUPERCRITICAL STORAGE SYSTEM CHECK HIGH-PRESSURE LEAK TESTS, ECS, RCS, SPS CHECK GUIDANCE AND NAVIGATION SYSTEM CHECK BIOMEDICAL AND OTHER INSTRUMENTATION CHECK ALL SYSTEMS, INTEGRATED
1 TO 4 MONTHS	BEGIN POST- FLIGHT CRITIQUE AND MISSION ANALYSIS	REVIEW OPERATIONS AND MISSION	X X X X X X J X X X	EVALUATE OPERATIONS, MAINTENANCE SAFETY PROCEDURES EVALUATE COMMUNICATIONS AND INSTRUMENTATION EVALUATE RECOVERY AND TRACKING OPERATIONS EVALUATE PROTECTIVE CLOTHING AND EQUIPMENT EVALUATE ENVIRONMENTAL REQUIREMENTS EVALUATE CREW REQUIREMENTS PROGRAM EVALUATE FACILITY, WORK LAYOUT, SUPPORT, PERSONNEL, TOOLS, EQUIPMENT, TRAINING EVALUATE EVERY SEQUENCE AND FUNCTION OF THE MISSION EVALUATE CURRENT DESIGN EVALUATE DESIGN PROBLEMS PHASE NEW DESIGN AND PROCE- DURES INTO SYSTEMS RECOMMEND DISPOSITION OF CAPSULE FINALIZE TECHNICAL REPORT	
	BEGIN COMMAND MODULE REFURBISHMENT	OVERHAUL REPAIR COMMAND MODULE	X X X X X X J X X X	NASA ISSUES WORK ORDER TO NAA COMMAND MODULE SHIPPED TO S&D COMMAND MODULE DISASSEMBLED ASSEMBLIES DELIVERED TO VENDORS AND MANUFACTURERS FOR REPAIR/ MODIFICATION MODULE REFURBISHED AND PRE- PARED FOR SHIPMENT	
		ADJUST SPARES INVENTORY	X X X X X X J X X X	OBsolete SPARES ARE SCHEDULED FOR MODIFICATION OR LISTED ON A SURPLUS LIST AND SEGMENTED SCRAP, NON-REPARABLE, NON- MODIFIABLE SPARES ARE SCHEDULED FOR DISPOSAL ACTION SPARES PECULIAR TO THE COMMAND MODULE ARE SEGMENTED, SCHEDULED FOR MODIFICATION OR DISPOSAL INVENTORIES ARE ADJUSTED	
		ADJUST TRAINING PROGRAM	X X X X X X J X X X	SKILL LEVELS ARE INCREASED CURRICULUM IS ADJUSTED REFRESHER COURSES SCHEDULED	

LEGEND:
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Figure 19.

Post-Flight Time Line—Lunar Orbital Mission

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LUNAR LANDING MISSION OBJECTIVES

OVERALL OBJECTIVE

The overall objective of this mission is the verification of the feasibility of a 14-day, multimanned mission including lunar landing, limited observation and exploration of the moon in the vicinity of the landing area, and safe return to earth.

SPECIFIC OBJECTIVES

Specific objectives of a typical lunar landing mission include the following:

- Verification of the capability of a manned Apollo Spacecraft to complete a lunar landing mission
- Verification of the capability of a manned LEM to make a lunar landing
- Verification of the capability of a single-manned C/M - S/MII to operate in lunar orbit
- Verification of the operation of GOSS with the crew on the lunar surface
- Limited lunar observation and exploration
- Evaluation of crew reaction to lunar environment
- Scientific experimentation

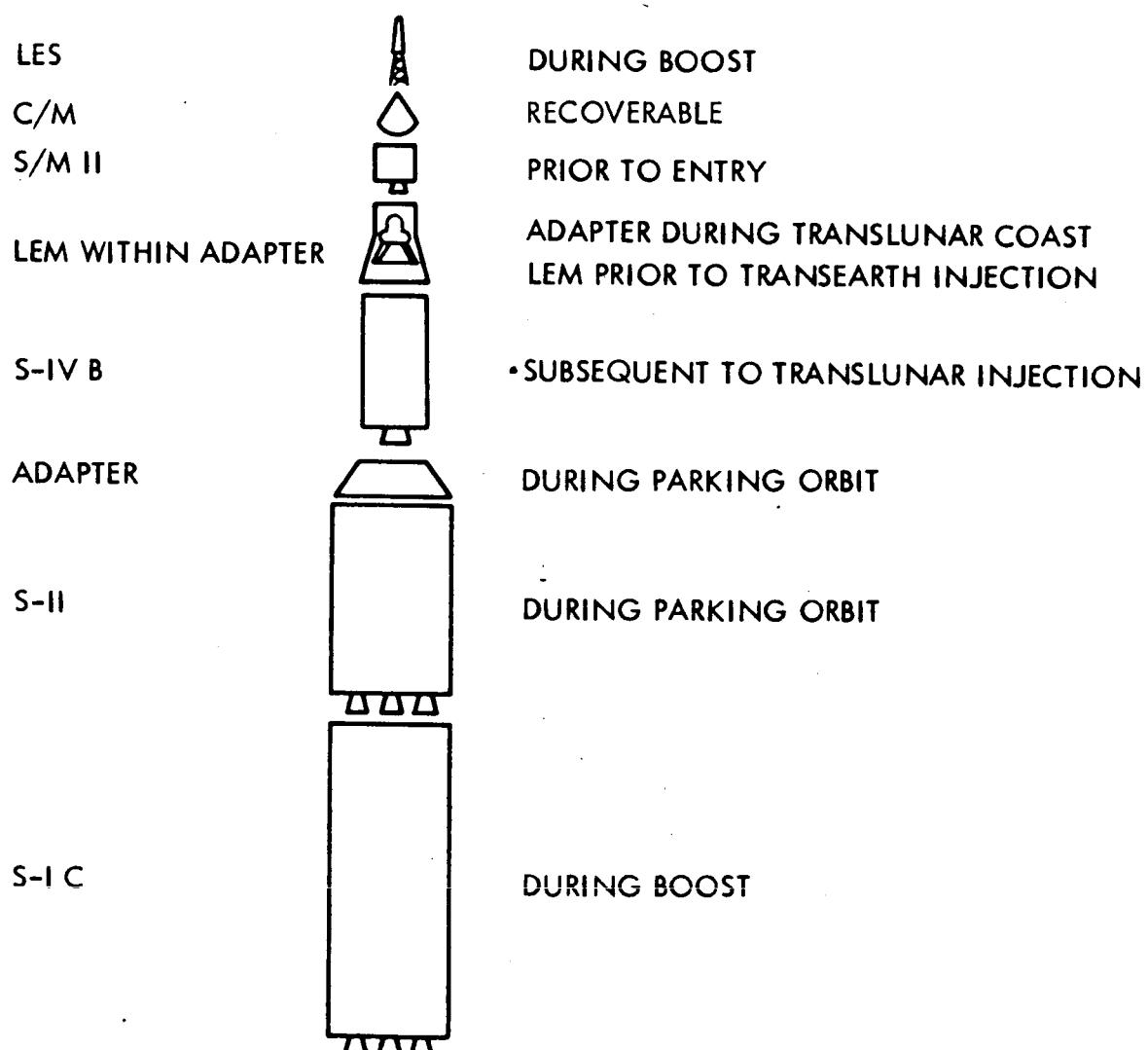
~~CONFIDENTIAL~~SEPARATION OF SPACECRAFT MODULES
AND LAUNCH VEHICLE BOOSTER STAGES

Figure 20. Space Vehicle Configuration—Lunar Landing Mission

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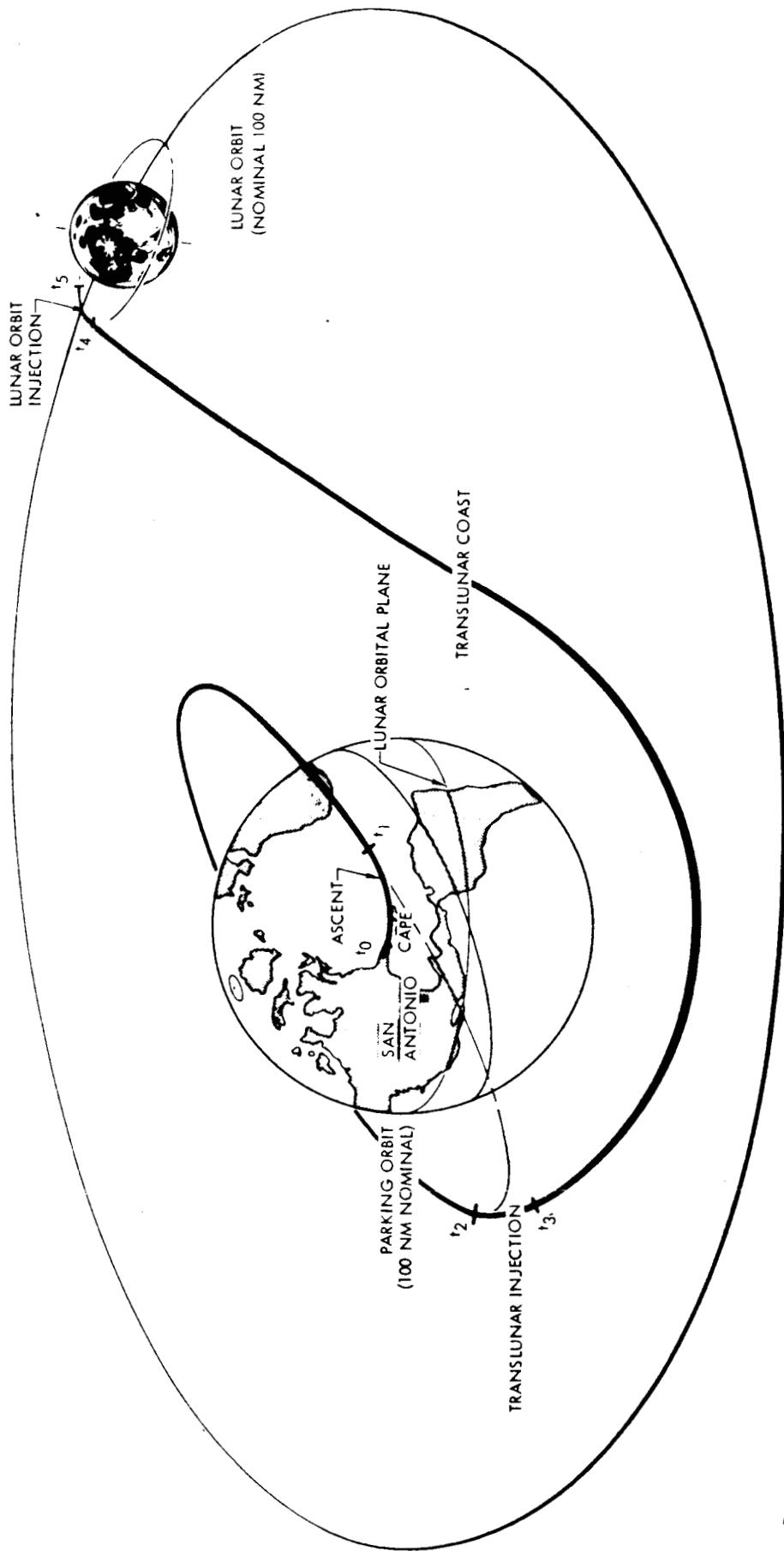
~~CONFIDENTIAL~~

Figure 21. Flight Trajectory—Lunar Landing Mission
(Translunar Flight)

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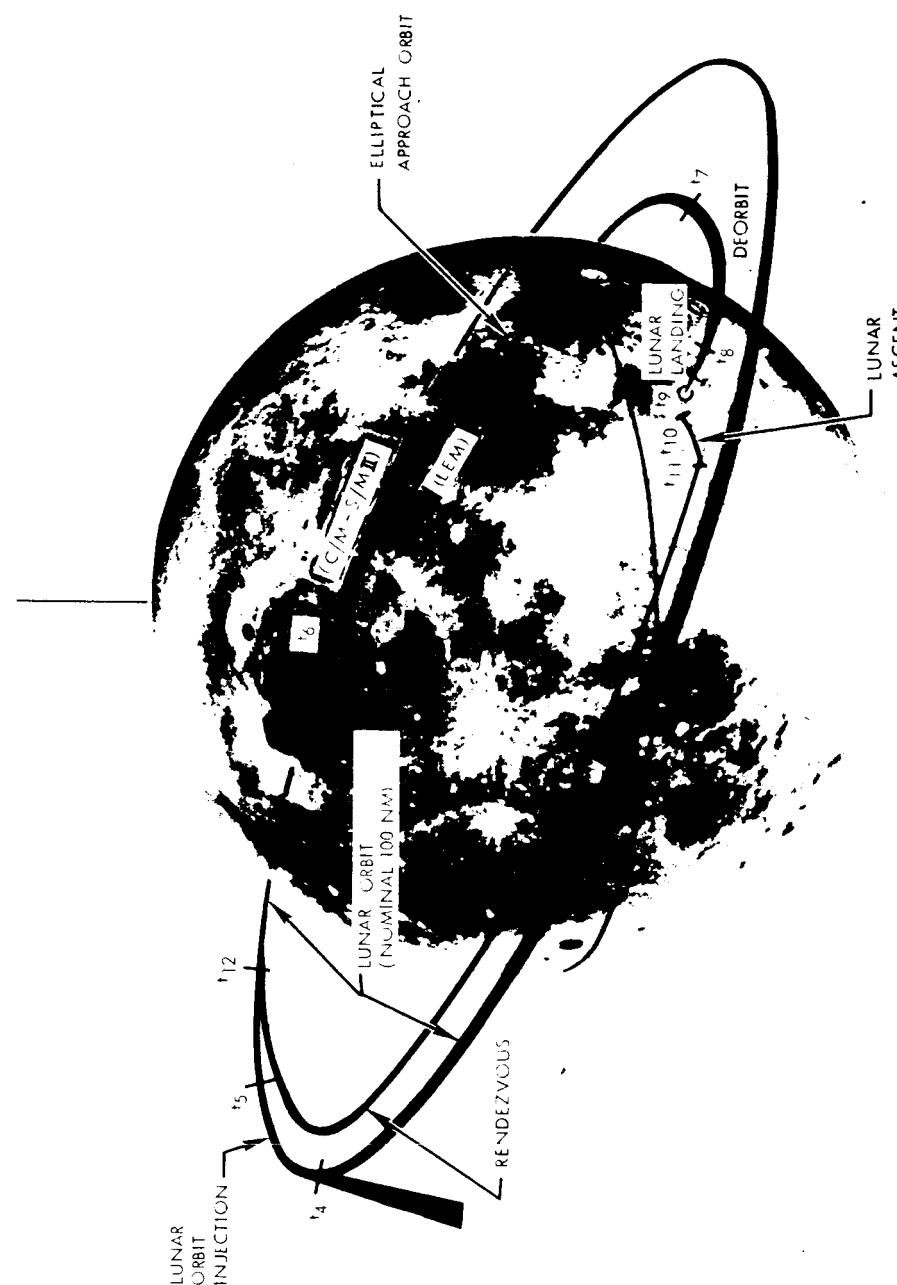
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Figure 22. Flight Trajectory—Lunar Landing Mission
(Lunar Vicinity)

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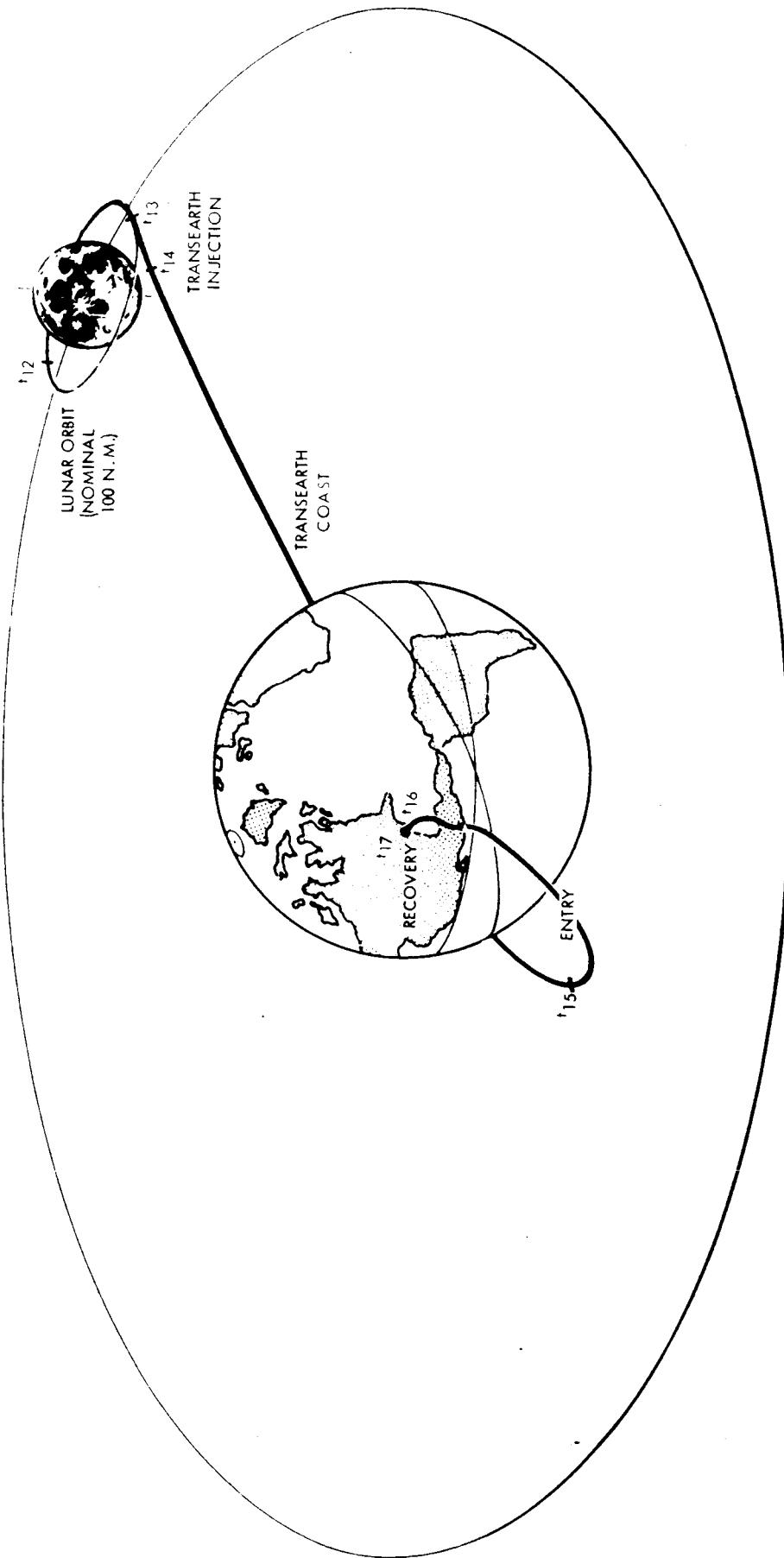
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Figure 23. Flight Trajectory—Lunar Landing Mission
(Transearth Flight)

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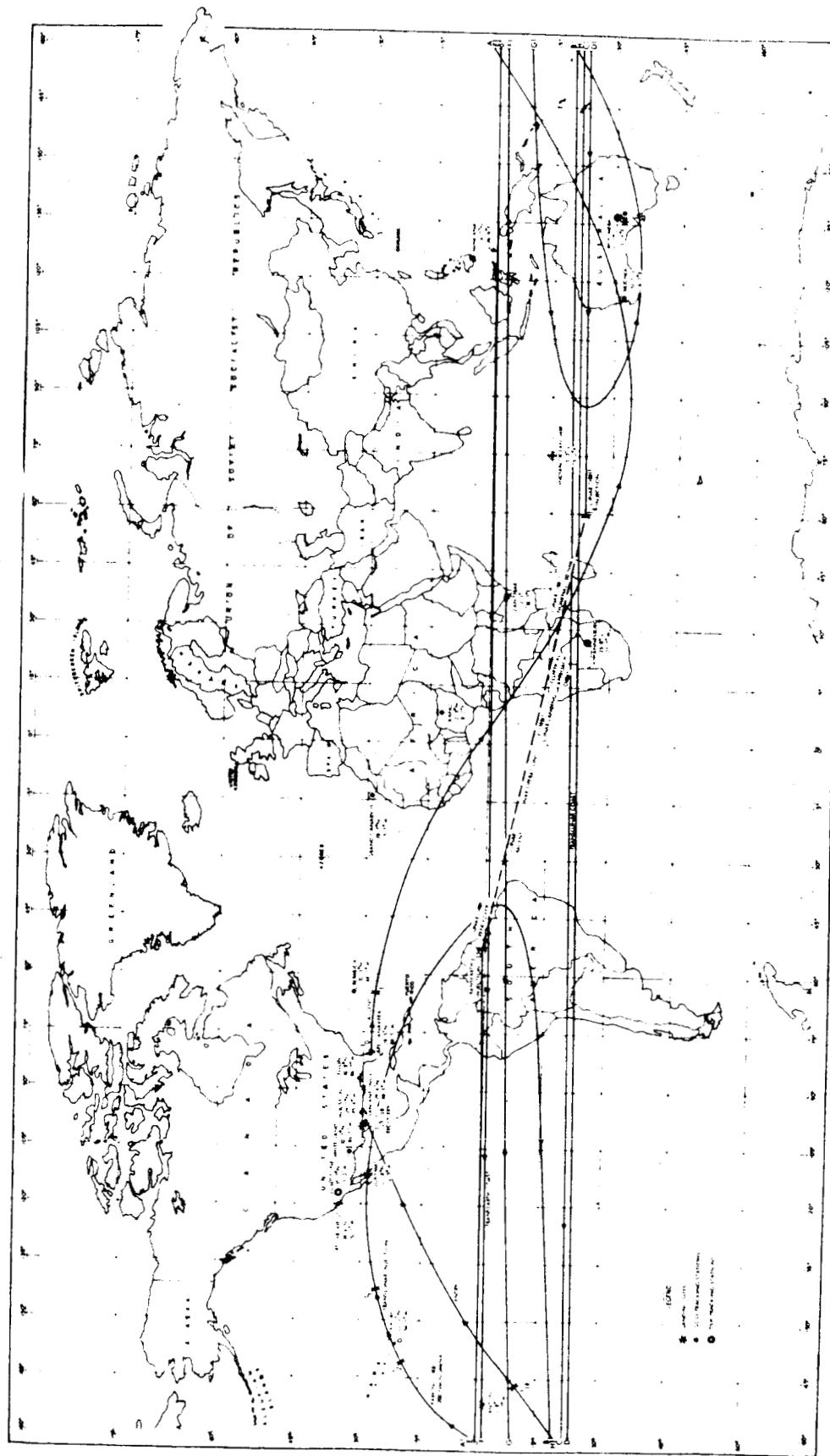
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Figure 24. Trajectory Earth Trace—Lunar Landing Mission

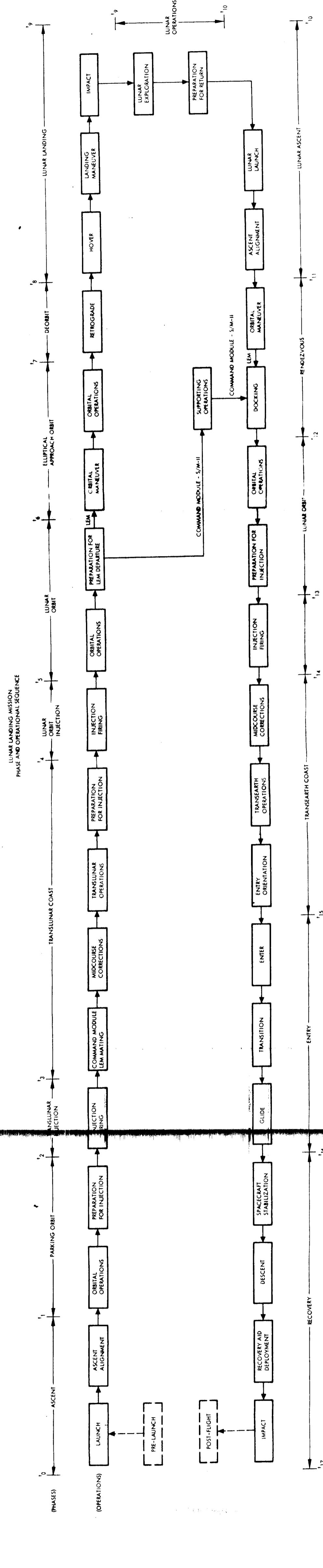


Figure 25. Phase and Operational Sequence—Lunar Landing Mission

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Figure 26. Flight Time Line—Part I—Lunar Landing Mission

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LUNAR LANDING MISSION FLIGHT TIME LINE - PART 1			SPACECRAFT SYSTEM STATUS						SPACECRAFT AND CREW FUNCTIONS			
PHASE	MAJOR EVENTS	SPACECRAFT OPERATIONS	COMMAND MODULE			SERVICE MODULE		LUNAR EXCURSION MODULE				
			ENVIRONMENTAL CONTROL ELECTRICAL POWER GUIDANCE/NAVIGATION STABILIZATION CONTROL COMMAND MODULE REACTION CONTROL COMMUNICATIONS/INSTRUMENTATION LAUNCH ESCAPE	COMMAND MODULE STRUCTURE CREW EQUIPMENT	ENVIRONMENTAL CONTROL ELECTRICAL POWER GUIDANCE/NAVIGATION SERVICE MODULE REACTION CONTROL SERVICE PROP	COMMUNICATION/INSTALLATION SERVICE MODULE STRUCTURE	ENVIRONMENTAL CONTROL ELECTRICAL POWER GUIDANCE CONTROL LEM REACTION CONTROL LEM PROPULSION	COMMUNICATION/INSTALLATION LEM STRUCTURE				
(PRE-LAUNCH)	S-IC IGNITION (HOURS)	LAUNCH	O O S S X O S X O O	O O S S X S O O	O O S S X S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	MONITOR S-IC IGNITION MONITOR BOOST MONITOR S-IC SEPARATION MONITOR S-II IGNITION MONITOR ESCAPE TOWER JETTISON AUTOMATIC FUNCTION OVERRIDE COMMUNICATE SPACECRAFT STATUS TO GOSS MONITOR SPACECRAFT SYSTEMS		
ASCENT	S-IC CUT OFF S-C SEPARATION S-I IGNITION ESCAPE TOWER JETTISON	ASCENT ALIGNMENT	O O S S X O J X O O O	O O S S S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	MONITOR TRAJECTORY TRAJECTORY PREDICTION BOOSTER ATTITUDE MANEUVER		
	505 SEC (MIN)	ORBITAL OPERATIONS	O O O O X O J X O O O	O O O S S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	INITIATE AND MONITOR S-II SEPARATION COMMUNICATE WITH GOSS COMPUTE ORBITAL PARAMETERS ORBITAL CORRECTION EVALUATE CORRECTION ATTITUDE CONTROL MANEUVER SPACECRAFT SYSTEMS CHECKOUT SCIENTIFIC ACTIVITY REPORT PREPARATION		
PARKING ORBIT		PREPARATION FOR INJECTION	O O O O X O J X O O O	O O O S S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	NAVIGATION INJECTION PARAMETERS COMPUTATION FINAL ATTITUDE MANEUVER FINAL SYSTEM CHECK COUNTDOWN		
	68 MIN (SEC)	INJECTION FIRING	O O O O X O J X O O O	O O O S S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	INITIATE FIRING SEQUENCE MONITOR SYSTEMS DISPLAYS COMMUNICATE SPACECRAFT STATUS TO GOSS		
TRANSLUNAR INJECTION	1,273 S-IVB IGNITION	COMMAND MODULE - LEM MATING	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	INITIATE AND MONITOR S-IVB SEPARATION INITIATE AND MONITOR ADAPTER SEPARATION INITIATE AND MONITOR LEM DOCKING LEM SYSTEMS CHECKOUT		
	360 SEC (HR)	MIDCOURSE CORRECTION	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	TRAJECTORY DETERMINATION DETERMINE CORRECTION PARAMETERS AND PROCEDURE VELOCITY VECTOR CORRECTION ANALYZE CORRECTION		
TRANSLUNAR COAST		TRANSLUNAR OPERATIONS	O O O O X O J X O O O	O O O S S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	SPACECRAFT SYSTEMS MAINTENANCE COMMUNICATE WITH GOSS SCIENTIFIC ACTIVITY REPORT PREPARATION		
	69.067 HR (SEC)	PREPARATION FOR INJECTION	O O O O X O J X O O O	O O O S S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	NAVIGATION INJECTION PARAMETERS COMPUTATION FINAL ATTITUDE MANEUVER FINAL SYSTEM CHECK COUNTDOWN		
LUNAR ORBIT INJECTION	70.440 SERVICE MODULE PROPULSION IGNITION	INJECTION FIRING	O O O O X O J X O O O	O O O S S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	INITIATE FIRING SEQUENCE MONITOR SYSTEMS DISPLAYS COMMUNICATE SPACECRAFT STATUS		
	133 SEC (MIN)	70.477 ESTABLISH ORBIT	O O O O X O J X O O O	O O O S S O O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	X X X X X X O	SPACECRAFT SYSTEMS MAINTENANCE COMPUTE ORBITAL PARAMETERS ORBITAL CORRECTION EVALUATE CORRECTION ATTITUDE CONTROL MANEUVER LUNAR SURVEILLANCE COMMUNICATE WITH GOSS		
LUNAR ORBIT		PREPARATION FOR LEM DEPARTURE	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	ENTER LEM LEM SYSTEMS CHECKOUT COUNTDOWN		
	156 MIN (MIN)	73.077 LEM PROPULSION IGNITION	ORBITAL MANEUVER	(LEM ONLY)	(LEM ONLY)	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	INITIATE FIRING SEQUENCE MONITOR SYSTEMS DISPLAYS		
ELLIPTICAL APPROACH ORBIT		ORBITAL OPERATIONS	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	TRAJECTORY DETERMINATION ATTITUDE CONTROL MANEUVER LUNAR SURVEILLANCE COMMUNICATE WITH GOSS COMMUNICATE WITH C/M		
	30 MIN (MIN)	73.577 ARRIVAL AT PERILUNE LEM PROPULSION IGNITION	RETROGRADE			O O O O O O O	O O O O O O O	O O O O O O O	O O O O O O O	INITIATE FIRING SEQUENCE MONITOR SYSTEMS DISPLAYS LUNAR SURVEILLANCE		
DE-ORBIT	64.8 MIN (SEC)	73.685 ARRIVAL AT HOVER POSITION	HOVER			O O O O O O O	O O O O O O O	O O O O O O O	O O O O O O O	LUNAR SURVEILLANCE LANDING SITE SELECTION		
LUNAR LANDING		LANDING MANEUVER	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	DETERMINE LANDING PARAMETERS TRANSLATION DESCENT		
	90 SEC (HR)	73.710 LUNAR TOUCHDOWN	IMPACT			O O X X X O O	O O X X X O O	O O X X X O O	O O X X X O O	TOUCHDOWN SYSTEMS CHECKOUT SYSTEMS SHUTDOWN		
LUNAR OPERATIONS		LUNAR EXPLORATION	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	LUNAR EXPLORATION SCIENTIFIC ACTIVITY COMMUNICATE WITH GOSS COMMUNICATE WITH COMMAND MODULE REPORT PREPARATION		
	24 HR (SEC)	73.710 LUNAR LIFT OFF- LEM PROPULSION IGNITION	PREPARATION FOR RETURN			O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	LEM SYSTEMS MAINTENANCE COMPUTE LAUNCH PARAMETERS COMMUNICATE WITH COMMAND MODULE COUNTDOWN		
LUNAR ASCENT		LUNAR LAUNCH	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	INITIATE FIRING SEQUENCE MONITOR LEM STATUS		
	97.710 (MIN)	97.710 ASCE	ASCE ALIGNMENT			O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	MONITOR FLIGHT TRAJECTORY TRAJECTORY PREDICTION ATTITUDE CONTROL MANEUVER		
RENDEZVOUS	97.810 (MIN)	97.810 BISTY RENDEZVOUS (HOHMANN TRANSFER)	ORBITAL MANEUVER			O O O O O O O	O O O O O O O	O O O O O O O	O O O O O O O	INITIATE RENDEZVOUS MANEUVER MONITOR TRAJECTORY COMMUNICATE WITH COMMAND MODULE		
	98.060 (MIN)	98.060 COMPLETE RENDEZVOUS ESTABLISH ORBIT	DOCKING	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	ATTITUDE CONTROL MANEUVER COMMUNICATE WITH COMMAND MODULE INITIATE AND MONITOR LEM DOCKING		
LUNAR ORBIT		ORBITAL OPERATIONS	O O O O X O J X O O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	O O O S S O O	CREW ENTERS COMMAND MODULE INITIATE AND MONITOR LEM SEPARATION COMPUTE ORBITAL PARAMETERS ORBITAL CORRECTION EVALUATE CORRECTION COMMUNICATE WITH GOSS LUNAR SURVEILLANCE		
	94.8 MIN (SEC)	100.240 SERVICE MODULE PROPULSION IGNITION	PREPARATION FOR INJECTION	O O O O X O J X O O O	O O O S S O O	O O O S S O O	J J J J J J J	J J J J J J J	J J J J J J J	NAVIGATION INJECTION PARAMETERS COMPUTATION FINAL ATTITUDE MANEUVER FINAL SYSTEMS CHECK COUNTDOWN		
TRANSEARTH INJECTION		INJECTION FIRING	O O O O X O J X O O O	O O O S S O O	O O O S S O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	INITIATE FIRING SEQUENCE MONITOR SYSTEMS DISPLAYS COMMUNICATE SPACECRAFT STATUS		
	105 SEC (HR)	100.269 MIDCOURSE CORRECTION	MIDCOURSE CORRECTION	O O O O X O J X O O O	O O O S S O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	NAVIGATION TRAJECTORY DETERMINATION DETERMINE CORRECTION PARAMETERS AND PROCEDURE VELOCITY VECTOR CORRECTION ANALYZE CORRECTION		
TRANSEARTH COAST		TRANSEARTH OPERATIONS	O O O O X O J X O O O	O O O S S O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	SPACECRAFT SYSTEMS MAINTENANCE ENTRY PARAMETERS PREDICTION SCIENTIFIC ACTIVITY COMMUNICATE WITH GOSS REPORT PREPARATION		
	162.619 (SEC)	162.619 SERVICE MODULE SEPARATION	ENTRY ORIENTATION	O O O O X O J X O O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	INITIATE AND MONITOR S/M II SEPARATION COMPARE ACTUAL WITH PLANNED TRAJECTORY ATTITUDE CONTROL MANEUVER CREW PREPARATION MONITOR SPACECRAFT SYSTEM STATUS TRAJECTORY PREDICTION ROLL MANEUVER FOR RANGE CONTROL		
ENTRY		ENTER	O O O O X O J X O O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	PULL UP TO GLIDE SECONDARY ROLL MANEUVER		
	162.799 (SEC)	162.799 DROGUE CHUTE DEPLOYMENT	GLIDE	O O O O O O J S O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	GLIDE TO RECOVERY INTERFACE COMMUNICATION WITH GOSS		
RECOVERY		SERVICE COMMAND STABILIZATION	O O S O O O J S O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	DROGUE CHUTE DEPLOYMENT RADAR CHAFF DEPLOYMENT ATTITUDE CONTROL MANEUVER		
	163.183 (SEC)	MAIN CHUTE DEPLOYMENT	DESCENT	O O S O O O J S O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	MAIN CHUTE DEPLOYMENT COMMUNICATE WITH GOSS MONITOR SPACECRAFT DESCENT RATE		
	163.183 (POST-FLIGHT)	163.183 TOUCHDOWN	RECOVERY AID DEPLOYMENT	O O S O O O J S O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	GENERATE TRACKING SIGNAL RELEASE HEAT SHIELD PREPARE ATTENUATION DEVICES		
		IMPACT	S O S O O O J S O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	TOUCHDOWN SYSTEM SHUTDOWN PARACHUTE RELEASE		
LUNAR ORBIT	163.071 (HR)	LEM DEPARTURE	SUPPORTING OPERATIONS	O O O O X O J X O O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	MONITOR LEM SEPARATION COMMUNICATE WITH GOSS COMMUNICATE WITH LEM SCIENTIFIC ACTIVITY ATTITUDE CONTROL MANEUVER LUNAR SURVEILLANCE REPORT PREPARATION		
	163.071 (LEM RETURN)	DOCKING	O O O O X O J X O O O	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	J J J J J J J	ATTITUDE CONTROL MANEUVER COMMUNICATE WITH LEM INITIATE AND MONITOR LEM DOCKING		

Part II of the flight time line will be provided at a later date.

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NORTH AMERICAN AVIATION, INC.

SPACE AND INFORMATION SYSTEMS DIVISION



LUNAR LANDING MISSION POST FLIGHT TIME LINE			COMMAND MODULE SYSTEM STATUS		
PHASE TIME	MAJOR EVENTS	COMMAND MODULE AND SUPPORT OPERATIONS	ENVIRONMENTAL CONTROL GUIDANCE AND NAVIGATION COMMUNICATIONS POWER AND REFRIGERATION COMPUTER LAUNCH AND LANDING EARTH SENSING COMMAND MODULE STRUCTURE CREW EQUIPMENT	FUNCTIONS	SUBFUNCTIONS
N HOURS	COMMAND MODULE TOUCHDOWN	OPERATE RECOVERY AIDS	O O X X X O J O O O	DYE MARKER RELEASED BOMB OPERATES FLASHING BEACON OPERATES RECOVERY ANTENNA ERECTS RADAR BEACON SIGNALS TRANSMITTED VOICE TRANSMISSION - UHF/VHF FLOTATION GEAR OPERATES	
3 HOURS	COMMAND MODULE LOCATED	AIR-LAND SEARCH	O O X X X O J O O O	RADAR PICK UP AND FIX VOICE PICK UP AND FIX BROADCAST OF FIX BEACON FLASHES SIGHTED DYE MARKINGS SIGHTED AERIAL BOMB DETECTED	
N DAYS	ARRIVAL OF RETRIEVAL CREW	SECURE AND RECOVER COMMAND MODULE AND CREW	O O X X X O J O O O	RECORD INSTRUMENT READINGS ALL SYSTEMS TURNED OFF CHUTE/PARAGLIDE RELEASE HATCH SECURED ANTENNA CUT COMMAND MODULE PICKUP CREW PICKUP	RECEIVE AND UNPACK PREPARE FOR VISUAL INSPECTION
3 DAYS	DELIVER COMMAND MODULE TO SITE FOR INSPECTION AND CHECKOUT		X X X X X X J X O X	TRANSPORTED TO SITE UNLOADED ONTO SPECIAL VEHICLE MOVED TO INSPECTION SITE	
10 DAYS	ARRIVAL OF COMMAND MODULE AT SITE FOR INSPECTION	VISUAL INSPECTION OF COMMAND MODULE BY NASA AND CONTRACTORS	X X X X X X J A O X	RECEIVING INSPECTION, PHYSICAL REVIEW OF STRUCTURE VERIFY TELEMETRIC OR REPORTED MALFUNCTIONS OF COMMAND MODULE EQUIPMENT REVIEW CRITICAL DESIGN PROBLEMS VERIFY REQUIREMENTS FOR REDESIGN EVALUATE SPECIAL HANDLING EQUIP- MENT AND TOOLS RECORD ALL FACTS, DOCUMENT BY PHOTOS, ETC.	DISASSEMBLE AS REQUIRED AND REASSEMBLE PREPARE UNSATISFACTORY REPORTS, ECP'S, DCN'S ETC MEASURE PROPELLANTS, GASES AND LIQUIDS REMAINING IN TANKS PREPARE FOR OPERATIONAL TESTING
1 TO 4 MONTHS	BEGIN COMMAND MODULE ANALYSIS	ENGINEERING TESTS	O O O O O O J O O O	REVIEW CRITICAL DESIGN PROBLEMS VERIFY REQUIREMENTS FOR REDESIGN ANALYZE AND PLAN VERIFICATION OF ALL RECORDED AND REPORTED MALFUNCTIONS EVALUATE INSTRUMENTATION AND COMMUNICATIONS REQUIREMENTS CONDUCT ENGINEERING TESTS ON ALL SYSTEMS, SUBSYSTEMS, COMPONENTS CONDUCT WEIGHT, CG TESTS TEST AND EVALUATE PROTECTIVE CLOTHING AND EQUIPMENT EVALUATE SPECIAL TOOLS, EQUIP- MENT, PROCEDURES, TRAINING COURSES, AIDS, FACILITIES, WORKPLACE AND CREW LAYOUT PREPARE REPORT ON MALFUNCTIONS, OPERATIONS AND A TECHNICAL AND DISPOSITION REPORT NAA INITIATE REQUEST FOR NASA WORKORDER, FOR COMMAND MODULE REPAIR, REDESIGN, REFURBISHMENT	CHECK LOW PRESSURE LEAKAGE CHECKOUT INDIVIDUAL SYSTEMS CHECKOUT COMBINED SYSTEM, PREFIRING CHECK ALIGNMENT CHECK WEIGHT AND CG HORIZONTAL, VERTICAL, ALL AXES, AND MOTOR ALIGNMENT CHECK COMMAND MODULE OUTPUT TO LES, TVCS CHECK RECOVERY AIDS, DEVICES CHECK HIGH PRESSURE SYSTEMS AND ENVIRON- MENT CHECK FUEL CELL OPERA- TION, LOADS, LEAKS, RESPONSE CHECK FIRINGS FOR STABILIZATION CHECK RCS AND STABILIZATION FIRINGS POST FIRING PURGE POST FIRING SYSTEM CHECKS PREPARE COMMAND MODULE FOR VACUUM CHAMBER CHECK FOR LEAKAGE, CABIN AND SYSTEM, LOW PRESSURE CHECK ECS OPERATIONS IN VACUUM CHAMBER VACUUM CHAMBER CHECK OF EC SYSTEM CHECK VENT VALVE CHECK WATER EVAPORATOR CHECK CABIN LEAKS CHECK CABIN PRESSURE CONTROL CHECK GLYCOL-WATER AND RADIATOR OPERATIONS, AND TEMPERATURE CHECK CABIN TEMPERATURE CONTROL CHECK OXYGEN PRESSURE CHECK HEAT EXCHANGER AND PRESSURE CONTROL CHECK WATER PROduc- TION, H ₂ - O ₂ FLOW TEST CHECK FUEL CELL OPERA- TIONS, LOADS, LEAKS, RESPONSE CHECK SUIT OPERATION, ODOR, PRESSURE, CONTROLS PERFORM FLIGHT SIMULATIONS CHECK SUPERCRITICAL STORAGE SYSTEM CHECK HIGH-PRESSURE LEAK TESTS, ECS, RCS, SPS CHECK GUIDANCE AND NAVIGATION SYSTEM CHECK BIOMEDICAL AND OTHER INSTRUMENTATION CHECK ALL SYSTEMS, INTEGRATED
	BEGIN POST- FLIGHT CRITIQUE AND MISSION ANALYSIS	REVIEW OPERATIONS AND MISSION	X X X X X X J X X X	EVALUATE OPERATIONS, MAINTENANCE SAFETY PROCEDURES EVALUATE COMMUNICATIONS AND INSTRUMENTATION EVALUATE RECOVERY AND TRACKING OPERATIONS EVALUATE PROTECTIVE CLOTHING AND EQUIPMENT EVALUATE ENVIRONMENTAL REQUIREMENTS EVALUATE CREW REQUIREMENTS PROGRAM EVALUATE FACILITY, WORK LAYOUT, SUPPORT, PERSONNEL, TOOLS, EQUIPMENT, TRAINING EVALUATE EVERY SEQUENCE AND FUNCTION OF THE MISSION EVALUATE CURRENT DESIGN EVALUATE DESIGN PROBLEMS PHASE NEW DESIGN AND PROCE- DURES INTO SYSTEMS RECOMMEND DISPOSITION OF CAPSULE FINALIZE TECHNICAL REPORT	
	BEGIN COMMAND MODULE REFURBISHMENT	OVERHAUL/REPAIR COMMAND MODULE	X X X X X X X J X X X	NASA ISSUES WORK ORDER TO NAA COMMAND MODULE SHIPPED TO S&ID COMMAND MODULE DISASSEMBLED ASSEMBLIES DELIVERED TO VENDORS AND MANUFACTURERS FOR REPAIR/ MODIFICATION MODULE REFURBISHED AND PRE- PARED FOR SHIPMENT	
	ADJUST SPARES INVENTORY		X X X X X X J X X X	OBsolete SPARES ARE SCHEDULED FOR MODIFICATION OR LISTED ON A SURPLUS LIST AND SEGMENTED SCRAP, NON-REPARABLE, NON- MODIFIABLE SPARES ARE SCHEDULED FOR DISPOSAL ACTION SPARES PECULIAR TO THE COMMAND MODULE ARE SEGMENTED, SCHEDULED FOR MODIFICATION OR DISPOSAL INVENTORIES ARE ADJUSTED	
	ADJUST TRAINING PROGRAM		X X X X X X J X X X	SKILL LEVELS ARE INCREASED CURRICULUM IS ADJUSTED REFRESHER COURSES SCHEDULED	

Figure 27. Post-Flight Time Line—Lunar Landing Mission

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APPENDIX

ABBREVIATIONS

AMR	Atlantic Missile Range
GOSS	Ground Operational Support System
GSE	Ground Support Equipment
NASA	National Aeronautics and Space Administration
NAA	North American Aviation
DSIF	Deep Space Information Facility
C / M	Command Module
S / M II	Service Module II
LEM	Lunar Excursion Module
LV	Launch Vehicle
LES	Launch Escape System
ET	Escape Tower (LES)
EM	Escape Motor (LES)
JM	Jettison Motor (LES)
SPS	Service Propulsion System
RCS	Reaction Control System
EPS	Electrical Power System
ECS	Environmental Control System
TVCS	Thrust Vector Control Subsystem
RF	Radio Frequency
CG	Center Of Gravity

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